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Household's Vulnerability to Shocks in Zambia

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Abstract

Zambia is a county characterized by a high incidence of poverty and exposure to several types of shocks like HIV/AIDS, macroeconomic instability and periodic droughts. In this paper we conduct an in depth analysis of the incidence and impact of those shocks on poverty. The analysis of the HIV/AIDS epidemic, carried out using the data on the occurrence of the death of an adult in the previous 12 months and the existence of foster children, shows the existence of a general decrease in consumption with the exception of non poor rural families. The deterioration of the economic situation and the related high level of unemployment resulted in a lower level of economic well-being. Finally, the analysis of the impact of the drought shows that while a significant percentage (17 percent) of the poorest households in rural areas would experience significant losses in maize production (covering 8 percent of all the households), they are concentrated in a few communities in Southern, Central and Western provinces. In order to identify those households that might suffer more from the negative impact of the shocks and/or have a low level of human capital we defined "vulnerable households", those that are likely to be poor and exposed to shocks, and "chronically poor households", those that are likely to be poor and have low levels of human capital outcomes. According to this definition, about 20 percent of the households are vulnerable whilst almost 40 percent are chronically poor and 10 percent are at the same time both vulnerable and chronically poor and therefore at most risk. Private coping mechanisms and private transfers are very common, but they do not seem to be effective in helping households to deal with the adverse impact of shocks. On the other hand, household participation in food for work programs increase after the death of a household member. Therefore there is need for long term household human capital investments, programs to alleviate the burden of HIV/AIDS, and targeted programs for the alleviating weather related shocks like the drought.

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1. INTRODUCTION

Households and communities in Zambia face the risks of suffering from different types of shocks. Some shocks affect communities as a whole (these are often referred to as covariate shocks), such as economic and financial crises and natural disasters. Others affect one or a few households (idiosyncratic shocks), such as a death or a loss of a job. Even though, any household can be affected by those shocks, not all of them have the same probability of recovering from the consequences of suffering from them. Poor households that lack the necessary physical and human capital will be less likely to recover from it.

In this paper we conduct an analysis of vulnerability that takes into account the occurrence of a shock, the level of poverty and the availability of physical and human capital[1]. The definition of vulnerability used focuses on the impact of the likelihood of the occurrence of a shock on the current level of poverty (Christiaensen and Subbarao, 2001; Dercon and Krishnan, 2000; Hoddinot and Quisumbing, 2003; Hoogeveen et al. 2004). In this sense, vulnerability is both a cause and a symptom of poverty (Baulch and Hoddinot, 2000). We also attempt to expand on the strict definition of income (consumption) poverty in an attempt of incorporating other approaches to the definition of poverty that take into account other measures of deprivation[2].

In this context, certain groups in society are more vulnerable to shocks that threaten their livelihood or even their survival. Some groups are so vulnerable that they live in a chronic state of impoverishment where their livelihood remains in a constant state of risk. According to the broad definition of vulnerability used in this paper, we define as "vulnerable" those households that are poor and are more likely to suffer from the realization of a shock and "chronic poor" those households who are poor and are likely to remain poor, given their low level of human and physical assets. Those households, which are both vulnerable to shocks and are chronic poor, are those that have the least chance of recovering from shocks.

The emphasis on the impact of shocks on consumption leads to a concept of vulnerability different from the one, which is used by those authors (Chaudhuri, 2000; Dercon 2001, among others), who have concentrated their efforts on the analysis of vulnerability with respect to the probability of being poor and to remaining poor in the future conditional on the occurrence of exogenous shock[3].

The analysis of vulnerability proposed is crucial for determining *which* programs to have in place and *when* to introduce them or adjust their levels and/or coverage. To make these decisions, policymakers need have access not only to macro-economic indicators, but also to indicators that provide an understanding of household-level vulnerability and risk profiles and risk management mechanisms, particularly for the poor.

We also believe that this approach to vulnerability analysis is particularly useful in the Zambian context, given the large proportion of poor people (73 percent) and the low level of human capital

[1] For a review of the concept of vulnerability see: Dercon, 1999, 2002; Hoddinot and Quisumbing, 2003; Hoogeveen et al. 2004; Prowse, 2003; among others.
[2] This analysis follows the recent interest in reducing vulnerability by helping poor people to manage risk. Reflecting the multi-dimensional approach to poverty, as developed in the *World Development Report 2000/2001: Attacking Poverty*.
[3] A longitudinal analysis of the evolution of poverty was not possible because the household surveys collected in 1991, 1993, 1996 and 1998 were based on a different set of households and sampling frame.

and outcomes. Risk and insecurity are an important component of poverty in Zambia (World Bank, 2003). In fact, among the broad mass of "poor" people, certain groups can be considered particularly vulnerable to shocks due to their lack of human, physical and social capital with which to confront shocks.

The main purpose of this paper is therefore to assess the extent of vulnerability to the most relevant shocks in Zambia and to determine its impact on poverty. The analysis carried out in the paper uses existing household surveys and secondary data sources in order to: a) identify the main sources of covariate and individual shocks; b) determine the impact of major shocks and other exogenous variables on poor households to find out which households have been affected the most; c) assess the relevance of available risk minimization and coping strategies employed by the Zambian households; and d) identify those households which are poor and chronically vulnerable to shocks and poverty.

The results show that the shocks identified in this paper (HIV/AIDS, macroeconomic downturn and drought) do have a negative impact on household consumption. They also show that not all poor households are vulnerable to shocks and some of them are chronically poor and do lack the human and physical capital or have adequate means necessary for recovering from the negative impact of natural or economic shocks.

After the introduction, the second session describes the main risks faced by the households in Zambia and the data utilized to quantify them and analyze their impact. The analysis of the incidence of those shocks and their impact on observable outcomes is presented in section 3. In section 4, we report the results of the analysis of the relationship between vulnerability and chronic poverty. Section 5 reports the evaluation of the impact of coping mechanism on vulnerability and section 6 reports the results of the analysis of the relationship between vulnerability and chronic poverty. Conclusions are presented in the seventh and final section.

2. IDENTIFICATION AND MEASUREMENTS OF SHOCKS

2.1 MAIN SHOCKS

Among all the covariate and idiosyncratic shocks that can have a negative impact on the lives of poor households in Zambia in this analysis we focus on: a) the negative consequences of the spread of HIV/AIDS; b) the effects of the macroeconomic crises; and c) the occurrence of drought (World Bank, 2003).

HIV/AIDS

Zambia is currently facing a major HIV/AIDS epidemic. HIV/AIDS has become the most important cause of illness and death among the young and middle aged adults and it is likely to remain relevant in the near future. In 2003, HIV prevalence was close to 20 percent (World Bank, 2003). HIV/AIDS has a major impact on the life of people and can no longer be considered only a health problem, but also an economic and social problem with long term consequences. The death of adults decreases the earning income capability of households both because often the most productive members die and because it diverts other members away from productive activities to take care of those who are sick. In addition, the death caused by HIV/AIDS creates a large number of orphans,

who are more likely to become malnourished and have lower educational attainment. Finally, those households that are affected by HIV/AIDS tend to consume their savings and sell their assets to pay for medical expenses or funerals, or additional care for children.

The impact of HIV/AIDS (as for other shocks) on households is obviously not felt equally by everybody and it is more likely to be worse for the poorest households, which are less able to cope with its impact. Some studies (Zambia VAC, 2003) suggest that HIV/AIDS disproportionately affects the agricultural sector relative to other sectors because this sector is much less able to replace the losses of human resources relative to other sectors. Therefore, HIV/AIDS-affected households may suffer from lower production, due labor and other agricultural inputs constraints (Zambia VAC, 2003). Besides, because HIV/AIDS tends to increase the prevalence of female headed farm households, they would have to deal with the loss of the most experienced household member, who had the agricultural knowledge and farm management skills. Finally, HIV/AIDS also affects the age structure of the households and their productivity, since the most productive members of the families are those that are most likely to die.

Macroeconomic shocks

The adverse impact of copper price deterioration, the decrease of the copper production level, which has been Zambian primary export commodity for decades, and other unfavorable macroeconomic conditions resulted in significant job losses. In fact, in 2002, copper output was estimated to be at a third of the highest level ever attained (Zambian PRSP, 2002) and employment in the formal sector was estimated to have fallen from 12 percent to 11 percent from 1996 to 1998 (Zambian PRSP, 2002). As a result, demand deteriorated, dragging down the rest of the economy, thus reducing even further the demand for labor.

Drought

The impact of the drought is felt mostly by the farmers, because of the loss of production and loss of cattle, and by consumers, because of the higher consumer prices of food commodities in general and of maize in particular. In the last ten years Zambia suffered four droughts of different severity (1991-92, 1994-95, 2000-01 and 2001-02). Despite the fact that drought and weather shocks are common in Zambia, the Zambian government has taken limited action to anticipate the shocks and design the proper response (World Bank, 2003).

2.2 SOURCES OF DATA

The sources of data used in this analysis include mainly the Zambian Living Conditions Monitoring Survey (LCMS), collected between November and December 1998 by the Central Statistical Office (CSO), and other secondary sources. The nationally representative LCMS household survey covers about 18,000 households in all nine provinces, both in urban and rural areas. In addition to the household level data, we also used secondary level data, by enumeration districts, on maize harvested and planted in 2002, collected by FAO, and on rainfall data, collected by WFP. Finally, the analysis used also detailed price information collected at the province level in 1997 and 1998 (Zambian Department of Agricultural Marketing).

The definition and classification of poverty used in this paper follows the CSO food basket approach to poverty measurement. Households with a per adult equivalent expenditure below the CSO poverty line have been defined as poor. In particular, households in the lower 30 percentile of the

expenditure distribution have been classified as very poor. The distribution of population and poor people by province and area in Zambia in 1998 is reported in Table A1. The table shows that poverty rates are very high. Overall 73 percent of the population is classified as poor. In rural areas, poverty rates are even higher (83 percent) especially in the Western provinces (91 percent). In urban areas 56 percent of the population is classified as poor, with a higher concentration in the Copperbelt area, where 6 percent out of 15 percent of the very poor (those in the bottom 30 percentile) are located.

Limitation of the data

Even though, the Zambian Central Statistical Office collected four nationally representative household surveys in 1991, 1993, 1996 and 1998, it was not possible to construct a panel data set and conduct a longitudinal analysis. The surveys were independent of each other and collected information from different households in each year (Mc Culloch et al, 2000). Therefore, we could not conduct an evaluation of the impact of the lack of any form of insurance against shocks on the level of asset and thus induce greater vulnerability in subsequent periods.

Moreover, the household data set we are using does not contain detailed information on the prevalence of the main shocks and the consequences on the households that have suffered them. Therefore, we had to approximate the incidence of these shocks using the limited information available in the household survey and in secondary data sources.

2.3 MEASURING THE INCIDENCE OF SHOCKS

The selection of indicators to measure the incidence of shocks at the household level using the data available represents a challenge because most of the variables needed were not available in the household data set. The solution has been to approximate in the best possible way the realization of the shocks identified in the analysis using available variables and ad hoc estimates using secondary data sources. The list of the indicators for each source of vulnerability is presented in Table 1 and the rational for their selection is presented below.

Table 1 – Indicators of Sources of Vulnerability to Shocks

Source of vulnerability	*Leading Indicators*	**Reference Age Groups**
HIV/AIDS	At least one death in the past 12 months	All
	At least one died between 15 and 49 years of age	(15-49)
	At least one child without any parent	(<15)
	At least one child without both parents	(<15)
Copper Crises and Unemployment	At least one unemployed	(15-49)
	At least one who left job & unemployed now	(15-49)
Drought	Loss of Production (Maize) More than 10% of income	All
	Loss of Production (Maize) More than 10% of expend	All

Source: Author's calculation

HIV/AIDS

We initially used four variables to determine if a household has been affected by HIV/AIDS: a) the occurrence of at least one death in the household in the previous 12 months, b) the occurrence of the death of at least one person between 15 and 49 years of age, c) the presence of at least one child (under the age of 15) with only one parent; and d) the presence of at least one child without both parents.

While it is obvious that the occurrence of a death in the household can provide only a rough approximation of the extent of the current HIV/AIDS problem in Zambia, it is not necessarily clear that it is an overestimate of the actual dimension of the problem. On one hand the death of an adult in the previous 12 months can also be related to other causes, thus providing an overestimate of the problem of HIV/AIDS. On the other hand this indicator does not take into account the large number of deaths related to HIV/AIDS that occurred in the previous years and the large number of people that are currently HIV positive. Nevertheless, this variable can give a good indication of the extent of the impact of this problem and the households that are more at risk. Moreover, as discussed below, the results are consistent with 2002 DHS data on HIV/AIDS and HIV prevalence.

The last two indicators, based on the presence of foster children, put more emphasis on the burden of the HIV/AIDS epidemic on the rest of the community. In fact, children that lost one or both parents might be living in the same household that has suffered from an HIV/AIDS related death or coming from another family.

Macroeconomic shocks

The indicators used to approximate the impact of a macroeconomic shock on a household are: a) the presence of at least one unemployed person; and b) whether somebody lost their job in the last year and is still unemployed. While we all can agree that unemployment can be a good proxy of the occurrence of macroeconomic shock such as the copper crises, people can be unemployed for many other reasons. Nevertheless this is a good approximation of the negative consequences of the economic downturn that has occurred in Zambia.

Drought

Since Zambia was not affected by a drought when the household survey data was collected (in 1998) and the information contained in the questionnaire on agricultural production did not contain any questions relative to previous weather related shocks, we simulated the effect of the 2001 drought on the households in the 1998 data set. In other words, we identified the characteristics of those households which were more likely to suffer losses of production of maize based on the information from the level of losses of production experienced at district level after the latest drought that occurred in 2001[4]. What we did in practice is summarized in the following steps:

(i) First, we measured the incidence of losses of production of maize at district level using data on the last drought that occurred in 2001. Table 2 shows that most of the production of maize takes place in Central, Eastern and Southern provinces. Households in Southern and Western regions

[4] Note that even though, we focused on the impact of the drought on agriculture production, it is possible to conduct a similar analysis estimating the impact of drought on the loss of cattle and on the increase of consumer prices. Unfortunately we were unable to find good data on loss of cattle and on individual commodity consumer prices. We used maize prices, and in particular regional and seasonal price variation as explanatory variables in the multivariate models.

suffered the highest percentage of losses (66 and 55 percent respectively), while almost 50 percent of all losses were suffered in the Southern region[5].

Table 2 - Maize Production and Loss by Province in 2001

	Production per farmer	Number of Producesof	Total Value Production	Share of production	Value of Losses	Share of losses by province	Share of losses over total
	KW	N	(1,000,000 KW)	Percent	(1,000,000 KW)		
CENTRAL	51,799	102,978	5,334	25.9	919	17.2	18.8
COPPERBELT	17,542	104,848	1,839	8.9	205	11.1	4.2
EASTERN	22,370	227,899	5,098	24.7	247	4.8	5.0
LUAPULA	20,434	25,939	530	2.6	20	3.7	0.4
LUSAKA	29,022	31,480	914	4.4	167	18.3	3.4
NORTHERN	13,555	79,404	1,076	5.2	101	9.4	2.1
N-WESTERN	13,360	73,077	976	4.7	156	16.0	3.2
SOUTHERN	29,258	123,432	3,611	17.5	2,400	66.5	49.0
WESTERN	12,928	96,359	1,246	6.0	682	54.8	13.9
ZAMBIA	210,269	865,416	20,625	100	4,897		100

Source: FAO

(ii) Next, we estimated the amount of losses (measured as the percentage of number of bags of maize) at the district level as a function of average household characteristics (land used, percentage of hybrid maize production, access to agricultural assets, and distance from markets) and rainfall data[6]. The results of the model are presented in Table 3.

(iii) The percentage of potential losses suffered by individual farm households have been predicted using the coefficients from the model and the actual characteristics of farm households as observed in the 1998 household data[7]. The result of the predicted level and number of losses by province are presented in Table 4.

(iv) Households that suffered losses larger than 10 percent of their total income or expenditure have been identified as those that would be more likely to suffer negative consequences from the drought in circumstances similar to what happened in the 2001/2 production season.

[5] The losses in the production of maize were estimated using the difference between area harvested and planted in 2001.
[6] We used two measures of WFP data on percentage of normal rainfall by district for the 2001/2002 season.
[7] Note that the results have been calibrated by restricting the average district level data to be between 0 and 100 percent.

Table 3 – Modeling Maize Losses as Function of Average Household Characteristics – Dependent variable percentage of production losses

	(1) Using loss of rain from 94 mean	(2) Using % normal rainfall
Land	-0.00033	-0.00068
	(1.84)*	(3.24)***
Percent of hybrid maize	-1.32768	-2.74391
	(0.10)	(0.17)
Household education	-1.10117	-1.42453
	(0.44)	(0.49)
Distance to food market	-0.14425	-0.13076
	(0.49)	(0.39)
Distance to hammer mill	0.93201	0.49293
	(1.98)*	(0.92)
Distance to input market	-0.09501	-0.18558
	(0.51)	(0.86)
Distance to bank	0.00683	-0.13133
	(0.05)	(0.80)
Availability of plough	56.74542	115.17129
	(2.42)**	(5.07)***
Availability of crop Sprayer	-39.39306	-23.23034
	(1.12)	(0.57)
Availability of tractor	-1,042.35959	-390.71193
	(2.37)**	(0.81)
Amount of loss of rain 94 from mean	0.42936	
	(4.92)***	
% normal rainfall		-0.31256
		(1.82)*
Constant	16.93843	67.53199
	(0.66)	(1.88)*
Observations	71	71
R-squared	0.59	0.46

Note: Absolute value of t statistics in parentheses: * significant at 10%; ** significant at 5%; *** significant at 1%
Source: Author's calculation using: CSO 1998 LCMS, FAO, WFP

Table 4 – Percentage of Predicted Maize Losses by Province

	Rural				*Urban*			
Province	**Non Poor**	**Poor**	**Bot 30%**	**Total**	**Non Poor**	**Poor**	**Bot 30%**	**Total**
CENTRAL								
% Maize Loss	17.8	18.3	17.8	18.0	14.0	13.3	15.3	13.8
% Loss on Hh Exp	6.5	6.9	10.3	8.1	1.4	1.8	1.4	1.6
Num Hhs	16,947	33,637	33,142	83,726	6,078	10,540	2,624	19,242
COPPERBELT								
% Maize Loss	8.7	12.4	15.2	12.4	10.0	10.0	7.8	9.7
% Loss on Hh Exp	1.1	1.4	1.8	1.4	0.7	0.5	0.6	0.6
Num Hhs	12,597	25,141	17,497	55,234	19,426	23,559	6,630	49,614
EASTERN								
% Maize Loss	5.2	4.8	4.7	4.9	4.9	4.6	4.7	4.7
% Loss on Hh Exp	0.5	1.0	1.8	1.2	0.4	0.6	1.4	0.6
Num Hhs	47,235	90,941	76,474	214,650	4,729	6,398	1,666	12,793
LUAPULA								
% Maize Loss	5.4	3.9	3.1	4.1	2.4	2.0	2.2	2.2
% Loss on Hh Exp	0.5	0.7	0.4	0.5	0.2	0.2	0.1	0.2
Num Hhs	5,958	8,915	6,127	21,000	2,500	2,008	431	4,938
LUSAKA								
% Maize Loss	12.4	19.0	23.2	18.8	12.0	14.4	14.4	13.6
% Loss on Hh Exp	1.0	4.0	5.3	3.7	1.3	1.3	3.3	1.8
Num Hhs	7,334	10,750	10,449	28,533	943	1,273	730	2,946
NORTHERN								
% Maize Loss	8.9	7.5	13.8	9.3	6.1	9.5	15.3	9.5
% Loss on Hh Exp	0.6	0.7	5.5	1.8	0.2	0.9	1.5	0.8
Num Hhs	17,636	34,532	15,875	68,043	3,649	5,645	2,068	11,361
N-WESTERN								
% Maize Loss	14.1	16.6	17.9	16.3	12.4	14.1	12.2	13.0
% Loss on Hh Exp	0.9	1.6	2.8	1.8	0.7	1.4	1.7	1.1
Num Hhs	15,701	31,444	17,538	64,683	3,896	3,343	1,018	8,257
SOUTHERN								
% Maize Loss	66.8	65.8	66.7	66.3	66.8	71.6	61.4	68.4
% Loss on Hh Exp	6.3	13.8	16.0	13.1	2.8	2.1	5.1	2.7
Num Hhs	22,517	49,829	41,111	113,456	4,091	4,105	932	9,127
WESTERN								
% Maize Loss	50.9	54.5	56.8	55.0	51.8	50.0	51.9	50.9
% Loss on Hh Exp	4.1	6.8	14.2	9.7	1.9	5.3	16.2	5.7
Num Hhs	13,024	36,914	40,735	90,673	1,613	2,566	696	4,875
ZAMBIA								
% Maize Loss	21.3	23.8	27.3	24.5	15.9	16.0	14.8	15.8
% Loss on Hh Exp	2.4	4.4	7.5	5.0	0.9	1.1	2.0	1.2
Num Hhs	158,948	322,103	258,947	739,998	46,925	59,436	16,793	123,153

Source: Author's calculation using: CSO 1998 LCMS, FAO, WFP.

3. DETERMINANTS AND IMPACT OF SHOCKS

3.1 CHARACTERISTICS AND INCIDENCE OF SHOCKS

Incidence of shocks

The analysis of the incidence of shocks, summarized in Table 5 and Figure 1, reveals that there is a large number of households that are affected by shocks and the their number varies with respect to the indicators used.

Table 5 - Percentage of Households affected by Shocks

	Grand	Rural			Urban				
	Total	Non Poor	Poor	Bot 30%	Total	Non Poor	Poor	Bot 30%	Total
At least one died b/w 15 and 49	6.2	7.0	5.7	6.7	6.4	4.9	6.3	9.2	5.8
At least one child w/o any parent	16.7	10.2	14.7	20.6	15.9	14.7	20.6	26.3	18.0
At least one child w/o both parents	3.9	2.3	3.1	4.8	3.6	3.9	5.2	5.6	4.5
At least one unemployed	10.7	3.6	4.6	6.0	4.9	17.5	23.0	33.0	21.0
At least one who left job & unemployment	2.1	0.7	0.9	1.2	0.9	3.3	4.6	7.7	4.2
Percent of losses of Ag > 10% of Income	8.0	5.3	11.5	17.1	12.2	0.3	0.9	1.9	0.6
Percent of losses of Ag > 10% of Expenditure	5.6	4.1	7.3	12.7	8.6	0.2	0.2	1.0	0.3
Self Poverty - b/c lack of job opportunity	13.5	7.8	6.0	1.7	4.8	30.7	29.5	15.7	28.9
Self Poverty - b/c lack of hard econ times	2.0	1.5	1.0	0.8	1.0	4.2	3.3	2.6	3.7
Self Poverty - b/c lack of low wage	0.7	0.4	0.4	0.1	0.3	1.1	1.5	2.8	1.4

Source: CSO 1998 LCMS

In the case of HIV/AIDS shocks and its related impact, the data shows that overall 6 percent of the households suffered from the death of an adult household in the last 12 months. The data also show that there are over 300,000 foster families with at least one child without a parent (almost 17 percent of the total). This amounts to a total of 572,000 children that have lost at least one parent, consistent with the results from the latest DHS survey (UNICEF et al., 1999). Finally, about 4 percent of the households have a child who does not have any parents at all.

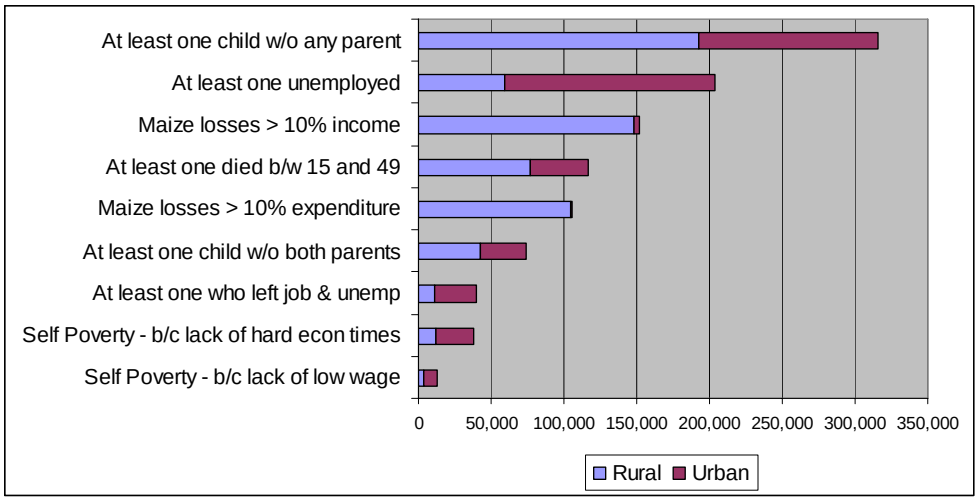
The number of the households affected by HIV/AIDS reported here is probably a lower bound estimate of the extent of the HIV/AIDS problem in Zambia. The 2002 Zambian DHS survey collected more specific data on HIV/AIDS and found that approximately 15 percent of the Zambian population aged 15-49 are HIV positive. Women show higher prevalence rates than men in the younger age groups (25 percent) and men tend to be more infected in the older age groups. Recent UN and WHO reports (UNICEF et al., 1999) estimate that 120,000 people died of HIV/AIDS in 2001 and about 570,000 children under 15 years of age lost one or both parents. They also show that HIV prevalence varies considerably by province. The highest prevalence rates are in Lusaka (25 percent) and the Copperbelt region (22 percent), which are also the most urbanized provinces. Infection rates in urban areas are twice as high compared to rural areas.

Among the indicators of the economic impact, unemployment is overall 11 percent, with a high level of 33 percent among the poorest people in the bottom 30 percentile of the distribution in urban areas. The economic losses from the drought, as expected, are more prevalent in rural areas. They affected between 100 and 150 thousand farm households. A recent vulnerability survey (Zambia VAC,

2003), identified the Luangwa valley, Gwembe valley, Shangombo, Kazungula/Sesheke and Mambwe as most drought-vulnerable zones.

The comparison of the number of people affected by the shocks, presented in Figure 1, identifies shows that relevance of the single parent orphans, followed by unemployment, losses of maize, the death of an individual between 15 and 49 years of age and so on. The difference between rural and urban areas is also clear, especially in the case of unemployment, which is mostly an urban phenomenon and losses of maize production, which is in rural areas.

Figure 1 - Ranking of Main Shocks – Urban and Rural



Source: CSO 1998 LCMS

The analysis of the Venn Diagrams (Figures 2A and 2B) shows that there is not very much interaction between the occurrence of HIV/AIDS, unemployment and losses of agricultural production. As expected, the death of an adult in the family is related to fostering, both in rural and urban areas (50 percent of households that suffered a death in the last 12 months also have an orphan child).

Figure 2A - HH experiencing unemployment, HIV/AIDS (death of adult) and foster children (without at least one parent) – <u>In rural area</u>

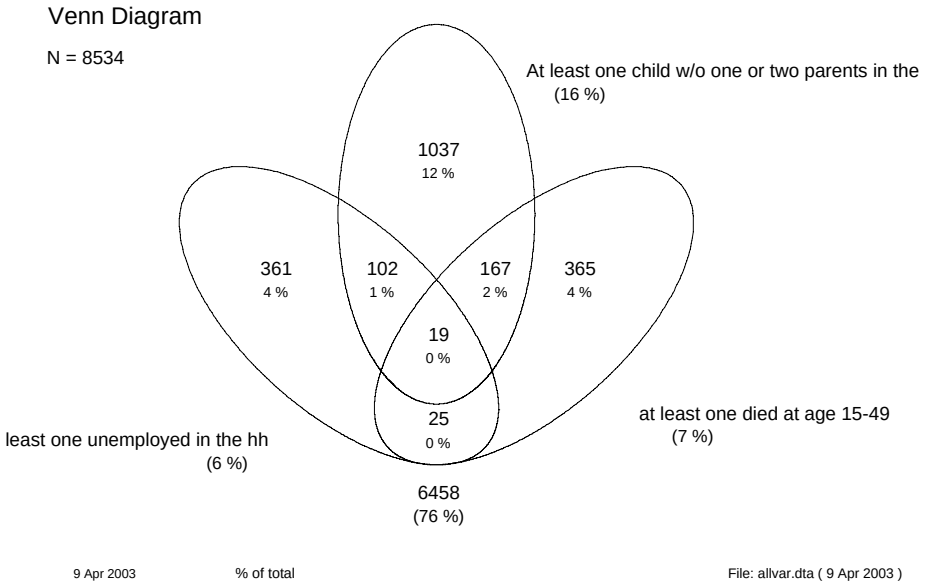
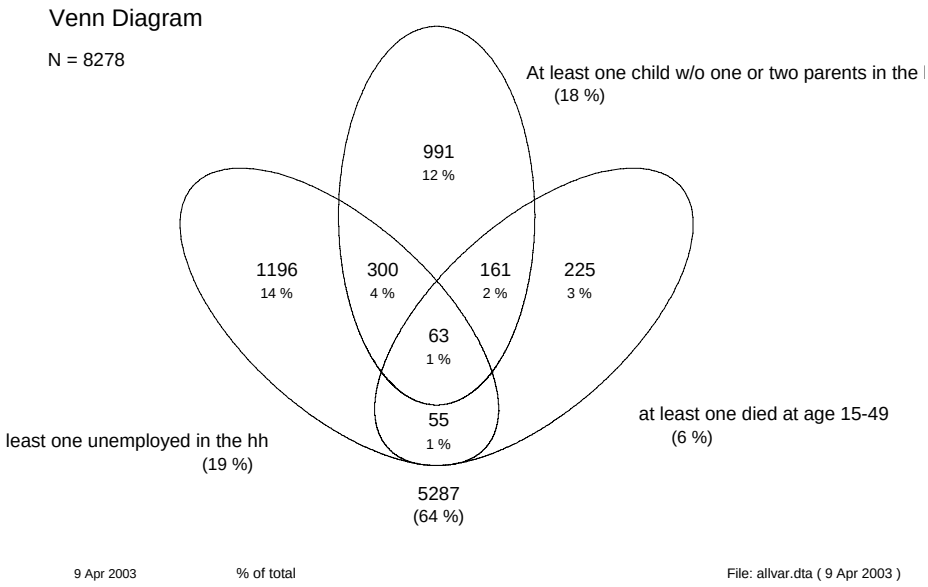


Figure 2B - HH experiencing unemployment, HIV/AIDS (death of adult) and foster children (without at least one parent) – In urban area

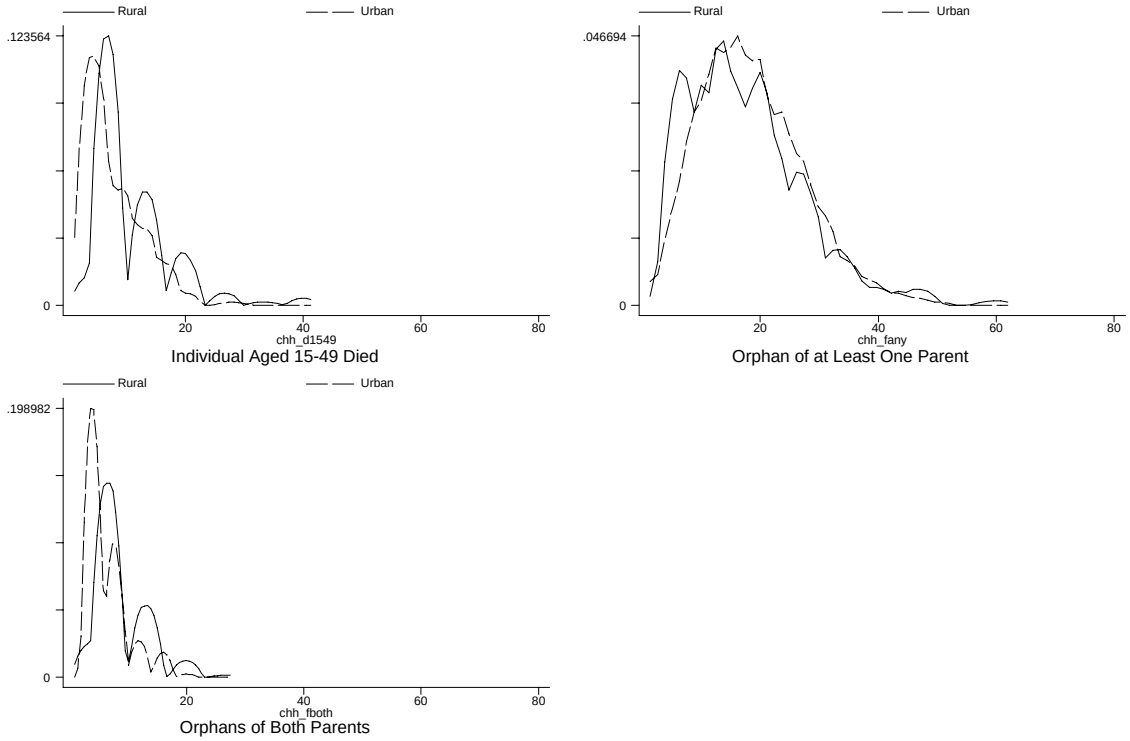


Source: Author's calculation using CSO 1998 LCMS

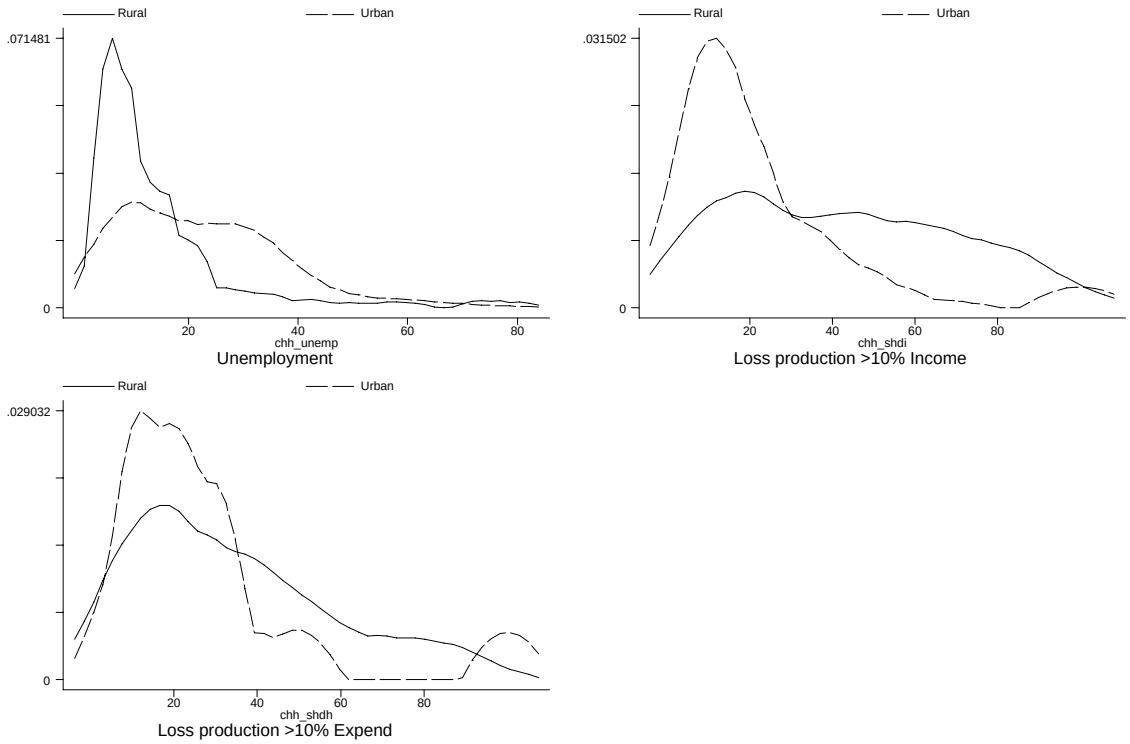
Nature of Shocks: Idiosyncratic versus Covariate

The analysis of the incidence of shocks across clusters in urban and rural areas helps to identify which shocks are covariate (i.e. many communities share the same problems) or idiosyncratic (localized shocks)[8]. The results, displayed in Figure 3, show that the occurrence of an individual death and of children orphans of two parents is concentrated around a few areas both in urban and rural areas, whilst the incidence of foster families with children without at least one parent is widespread. Therefore, HIV/AIDS seems to be an idiosyncratic shock localized within specific communities. Unemployment, instead, is common in urban areas and a localized phenomenon in rural areas. As expected, loss of agriculture production is a common shock in rural areas, even though it is much higher in a few provinces, and localized in urban areas.

Figure 3 - Shocks: Covariate or Idiosyncratic?



[8] In general, if the mean cluster values are distributed more evenly around higher percentages values, this means that the risks have a covariate nature. In other words, many communities share the same problems (i.e. we can say that those shocks are endemic in those areas). If, instead, the distribution of cluster means is concentrated around low percentage values, then we can say that those risks are idiosyncratic (i.e. they concern mostly a few individual households in those communities) and that are concentrated in specific geographical areas.



Source: Author's calculation using CSO 1998 LCMS

Determinants of shocks – Who is More Likely to Suffer from Shocks?

Probability models of being affected by a shock are used to establish if there is a relationship between the occurrence of the shock as measured by the indicators presented above and household endowments and other exogenous variables. We estimate separate models for urban and rural areas. The dependent variables used are the occurrence of each type of shocks and the explanatory variables used are: household characteristics (gender, age of household head, household demographics); human capital (education of different household members), physical capital; local characteristics (distance from main services, infrastructure, district dummies); community characteristics (leave out means of land access, income, agricultural income). The results are presented in tables 6A, 6B and 7.

Table 6A - Probability of Suffering from a Shock (Unemployment and HIV/AIDS) -Rural Areas

	(1)	(2)	(3)	(4)	(5)
	Unemploy-ment	**Death**	**Adult Mortality**	**Foster-any**	**Foster-both**
Household head is a female	-0.21962	0.05041	-0.10131	0.10020	0.01161
	(1.18)	(0.61)	(0.63)	(1.03)	(0.07)
Age of household head	-0.00261	-0.00017	0.00769	-0.00785	0.00758
	(0.60)	(0.08)	(2.08)**	(3.21)***	(1.95)*
(mean) widow fem head	0.25414	0.28224	0.93094	1.34966	0.38298
	(1.23)	(3.00)***	(5.44)***	(12.86)***	(2.30)**
(mean) separated fem head	0.43180	0.11453	0.27279	0.42403	-0.03651
	(2.12)**	(1.19)	(1.44)	(3.91)***	(0.20)
Number of females w/ no educ.	0.07176	0.14646	0.24705	0.24931	0.21305
	(0.29)	(0.93)	(0.78)	(1.63)	(0.95)
Number of females w/ 1-7 yrs of educ.	0.12801	0.13983	0.30644	0.28995	0.20371
	(0.52)	(0.89)	(0.97)	(1.90)*	(0.91)
Number of females w/ 8-9 yrs of educ.	0.14025	0.07981	0.33340	0.38422	0.32588
	(0.55)	(0.49)	(1.04)	(2.43)**	(1.41)
Number of females w/ >=10 yrs of educ.	0.14678	0.07931	0.30290	0.29345	0.01884
	(0.58)	(0.48)	(0.95)	(1.83)*	(0.08)
Number of males w/ no educ.	-0.07514	0.16204	0.29705	-0.29372	-0.04349
	(0.25)	(0.88)	(0.86)	(1.87)*	(0.16)
Number of males w/ 1-7 yrs of educ.	-0.15373	0.18494	0.31181	-0.30521	-0.05908
	(0.51)	(1.01)	(0.91)	(1.96)*	(0.22)
Number of males w/ 8-9 yrs educ.	-0.12634	0.10391	0.35635	-0.39016	-0.14693
	(0.41)	(0.56)	(1.03)	(2.42)**	(0.53)
Number of males >=10 yrs educ	-0.12237	0.16890	0.32649	-0.25217	-0.03928
	(0.40)	(0.90)	(0.94)	(1.56)	(0.14)
Asset index	0.12126	-0.05558	-0.06363	-0.02723	-0.04890
	(1.31)	(0.74)	(1.05)	(0.37)	(0.43)
Majority agricultural income	-0.33262	-0.01478	-0.07014	-0.05292	-0.15587
	(4.17)***	(0.38)	(0.96)	(1.20)	(2.23)**
HH, tot area under crop in hac	-0.07143	0.01588	0.01244	-0.02449	-0.01145
	(2.71)***	(1.29)	(0.58)	(1.53)	(0.44)
livestock index	-0.31086	0.03226	-0.02790	-0.00813	-0.10449
	(2.01)**	(0.75)	(0.33)	(0.16)	(0.99)
cluster avg land (ha)	-0.00115	-0.00269	0.03156	-0.00247	-0.00114
	(0.03)	(0.13)	(0.80)	(0.10)	(0.03)
log cluster avg income	-0.05754	0.03036	-0.05469	0.01581	-0.01620
	(0.89)	(0.85)	(1.01)	(0.40)	(0.26)
log cluster avg agr. income	0.00452	0.00326	-0.05247	0.00650	0.01366
	(0.09)	(0.11)	(1.52)	(0.19)	(0.25)
Avg Deviation from Prov Average Maize Price, 1998	0.00049	0.00057	-0.00009	0.00082	-0.00035
	(1.34)	(2.65)***	(0.24)	(3.26)***	(0.88)
spread in maize mon. price, 98	3.04325	-2.52122	-3.85168	-1.03725	0.01767
	(2.00)**	(2.45)**	(2.14)**	(0.88)	(0.01)
Constant	-2.84567	-0.18392	1.36539	-1.43504	-2.67200
	(2.56)**	(0.28)	(1.15)	(1.88)*	(2.24)**
Observations	7897	8116	6328	8116	7639

Notes: Absolute value of z statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%
Other variables included but not shown are household composition variables, number of individual employed in specific professions, distance to main public services and district dummies.
Source: Author's calculation using CSO 1998 LCMS

Table 6B - Probability of Suffering from a Shock (Unemployment and HIV/AIDS) -Urban Areas

	(1)	(2)	(3)	(4)	(5)
	Unemployment	**Death**	**Adult Mortality**	**Foster-any**	**Foster-both**
Household head is a female	0.18983	0.12355	-0.02939	0.27963	0.45723
	(1.97)**	(1.22)	(0.18)	(2.98)***	(3.48)***
Age of household head	0.00491	0.00088	0.00491	-0.00461	0.00331
	(1.73)*	(0.32)	(1.27)	(1.66)*	(0.74)
(mean) widow fem head	0.15966	0.42166	0.90973	1.35247	-0.36095
	(1.42)	(3.71)***	(5.20)***	(12.59)***	(2.30)**
(mean) separated fem head	0.17951	-0.03214	0.28999	0.07774	-0.87399
	(1.52)	(0.26)	(1.51)	(0.69)	(4.33)***
Number of females no educ.	-0.23989	-0.06539	0.15088	-0.19189	-0.16223
	(0.97)	(0.28)	(0.49)	(0.76)	(0.43)
Number of females w/ 1-7 yrs educ.	-0.19062	-0.02829	0.19572	-0.18156	-0.07376
	(0.77)	(0.12)	(0.65)	(0.72)	(0.19)
Number of females w/ 8-9 yrs educ.	-0.29844	-0.01415	0.20757	-0.18590	-0.00795
	(1.20)	(0.06)	(0.68)	(0.74)	(0.02)
Number of females w/ >=10 yrs educ.	-0.14803	-0.05447	0.26746	-0.11436	-0.03407
	(0.60)	(0.23)	(0.87)	(0.45)	(0.09)
Number of males w/ no educ.	0.11888	-0.12858	0.55151	-0.15105	-0.19547
	(0.49)	(0.51)	(1.27)	(0.54)	(0.44)
Number of males w/ 1-7 yrs of educ.	0.10788	-0.04239	0.58129	-0.04636	-0.15075
	(0.45)	(0.17)	(1.34)	(0.17)	(0.34)
Number of males w/ 8-9 yrs of educ.	0.00956	-0.07428	0.61406	-0.01890	-0.12044
	(0.04)	(0.30)	(1.41)	(0.07)	(0.27)
Number of males w/ >=10 yrs of educ.	0.00891	-0.16130	0.53223	-0.10342	-0.11101
	(0.04)	(0.65)	(1.22)	(0.37)	(0.25)
Asset index	-0.08441	-0.05542	-0.05916	0.01025	-0.01116
	(3.21)***	(1.95)*	(1.14)	(0.38)	(0.28)
majority agricultural income	-0.08732	-0.14663	-0.14923	0.06536	0.24200
	(0.74)	(1.39)	(1.78)*	(0.63)	(1.74)*
HH,total area under crop in hac	-0.08252	0.04627	0.02848	-0.00101	0.05831
	(2.42)**	(1.65)*	(1.27)	(0.04)	(1.71)*
livestock index	-0.00554	0.07057	-0.05501	-0.03865	-0.07696
	(0.09)	(1.19)	(0.63)	(0.55)	(0.55)
cluster avg land (ha)	-0.83677	0.03433	-0.04859	-0.07378	-0.35993
	(5.32)***	(0.22)	(1.07)	(0.48)	(1.49)
log cluster avg income	-0.03051	-0.08437	-0.05669	0.08361	0.05939
	(0.80)	(1.99)**	(1.07)	(2.09)**	(0.99)
log cluster avg agricultural income	-0.00007	0.00681	0.00572	0.03270	0.04952
	(0.00)	(0.36)	(0.18)	(1.70)*	(1.57)
Avg Deviation from Prov Average Maize Price, 1998	-0.00070	0.00006	-0.00043	0.00024	0.00301
	(0.92)	(0.09)	(1.10)	(0.37)	(2.46)**
spread in maize monthly price, 1998	0.06989	-0.26829	-4.64012	-2.07817	-26.31472
	(0.02)	(0.08)	(2.25)**	(0.66)	(.)
Constant	-1.70287	-0.49329	1.33729	-1.49271	10.35172
	(0.79)	(0.24)	(1.03)	(0.79)	(12.68)***
Observations	6992	6921	6144	6995	6674

Notes: Absolute value of z statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%
Other variables included but not shown are household composition variables, number of individual employed in specific professions, distance to main public services and district dummies.
Source: Author's calculation using CSO 1998 LCMS

Table 7 - Probability of Suffering from the Drought -Rural and Urban Areas

	(1)	(2)	(3)	(4)
	Loss of Prod % income, Rural	**Loss of Prod % income, Urban**	**Loss of Prod % exp, Rural**	**Loss of Prod % exp, Urban**
Household head is a female	0.12872	-1.67805	0.01858	-0.74612
	(0.81)	(2.48)**	(0.12)	(0.86)
Age of household head	0.01339	-0.00525	0.00309	-0.00959
	(3.44)***	(0.33)	(0.78)	(0.42)
(mean) widow fem head	-0.28386	2.25293	0.01693	2.84403
	(1.57)	(2.92)***	(0.09)	(2.65)***
(mean) separated fem head	-0.11163	1.75887	-0.20917	1.93810
	(0.60)	(2.38)**	(1.11)	(1.89)*
Number of females w/ no education	-0.00764	1.08045	-0.17264	0.09780
	(0.05)	(1.58)	(1.11)	(0.13)
Number of females w/ 1-7 yrs of educ.	-0.01744	0.52843	-0.11323	0.32763
	(0.11)	(0.79)	(0.74)	(0.43)
Number of females w/ 8-9 yrs of educ.	-0.12056	0.75033	-0.17800	0.14049
	(0.67)	(1.09)	(1.06)	(0.18)
Number of females w/ >=10 yrs of educ.	0.10816	0.64415	-0.01062	-0.30846
	(0.60)	(0.93)	(0.06)	(0.37)
Number of males w/ no educ.	-0.11396	2.56841	-0.07629	7.49938
	(0.60)	(1.58)	(0.44)	(18.66)***
Number of males w/ 1-7 yrs of educ.	-0.21706	2.38683	-0.17955	7.30679
	(1.15)	(1.47)	(1.06)	(22.89)***
Number of males w/ 8-9 yrs of educ.	-0.31152	2.12719	-0.16079	7.31449
	(1.58)	(1.32)	(0.89)	(28.78)***
Number of males w/ >=10 yrs of educ.	-0.23237	2.46092	-0.26539	7.56563
	(1.15)	(1.52)	(1.45)	(23.06)***
Asset index	-0.05437	-0.08057	0.18545	0.16284
	(0.41)	(0.46)	(1.52)	(0.67)
majority agricultural income	1.21101	2.50483	0.43231	0.93133
	(15.25)***	(8.15)***	(5.89)***	(2.35)**
HH,total area under crop in hac	0.03379	0.22243	0.08121	0.33004
	(1.94)*	(2.06)**	(5.13)***	(2.07)**
livestock index	0.14003	0.80456	0.17232	1.01360
	(1.75)*	(1.97)**	(2.28)**	(1.93)*
cluster avg land (ha)	0.20340	1.10845	0.08993	1.78707
	(5.67)***	(1.16)	(2.47)**	(1.34)
log cluster avg income	-0.08706	-0.64085	-0.12436	-0.73931
	(1.20)	(1.25)	(1.71)*	(1.13)
log cluster avg agricultural income	-0.15909	-0.16866	0.02401	-0.29719
	(2.54)**	(0.78)	(0.38)	(0.91)
Avg Deviation from Prov Average Maize Price, 1998	-0.00057	-0.00043	-0.00082	-0.00195
	(1.81)*	(0.22)	(2.68)***	(1.06)
Spread in maize monthly price, 1998	-5.57389	0.47805	-2.10305	-11.82286
	(4.09)***	(0.05)	(1.61)	(1.35)
Constant	4.08504	8.26841	1.21200	17.69586
	(4.13)***	(1.05)	(1.29)	(2.09)**
Observations	3438	848	3806	606

Notes: Absolute value of z statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%
Other variables included but not shown are household composition variables, number of individual employed in specific professions, distance to main public services and district dummies.
Source: Author's calculation using CSO 1998 LCMS

The rural models show a strong association between HIV/AIDS shocks (higher death mortality and fostering) and widow female headed households, reflecting the death of the husband . Fostering is positively correlated with female education and negatively with male education. Rural unemployment is lower the higher the agricultural income, land and livestock ownership. In urban areas, fostering and death of adults are higher in female and widow female headed households, as expected. Urban unemployment is lower in households with more assets and with a higher number of professionals, sales and clerks. Urban unemployment is higher in households where the head is a female or is older. The probability of suffering from drought is higher for widow and separated female headed households, households whose income comes mainly from agriculture and that have a large proportion of area under crop.

Who is more vulnerable to shocks: Poor or Rich Households?

The correlation of the predicted probability of suffering from a shock with a wealth factor score can also shed some light on the relationship between risks and long term measure of welfare. An asset index can be a better measure of welfare in this case, since the current level of expenditure could have been affected by the current losses if the households had not been able to smooth consumption. The amount of assets available, instead might have not been modified in the recent past. The results show that rural unemployment is positively correlated with assets while drought and rural death present a strong negative relationship (Table 8 and Figures A1-A2d in the appendix).

Table 8 - Correlation b/w Asset and Livestock Index and Predicted Probability of Shock

Shocks	Rural	Urban
Unemployment	0.1869	0.0659
Changed Job and Now Unemployed	0.0806	-0.1501
Mortality	-0.1142	-0.2386
Adult Mortality	0.0048	-0.0312
Foster (any)	0.0812	0.0719
Foster (both)	0.0300	0.1210
Drought (Loss of production >10% income)	-0.0990	-0.1891
Drought (Loss of production >10% expenditure)	0.0439	-0.1739

Source: Author's calculation using CSO 1998 LCMS

3.2 IMPACT OF SHOCKS ON WELL-BEING

The key question remains: what is the impact of the shocks on the level of well-being of the households? To address this question, we would like to compare those households that have suffered a shock with a counterfactual represented by the same people if they had not suffered a shock. Since this is not possible, we use non-parametric and parametric techniques that can yield some estimates of the impact of the shocks.

Non-parametric techniques

The objective of non-parametric techniques is to compare the distribution of per adult equivalent expenditure[9] of the households that experienced a shock (the death of a household member in the previous 12 months, for example) with a counterfactual distribution built using those households that did not suffer from the shock, weighted by their probability of suffering the shock. This approach,

[9] In natural logs.

can help to: a) describe the distribution of households that experiences the shock (death in this case); b) find out if the households that suffer from the shock are poor or rich and thus know what would have happened to those households that suffered from the shock if they had not suffered it.
In the case of the drought, the analysis has been slightly different, since we compare the current distribution of maize farmers to a new distribution that includes weights to take into account the probability of losing a percentage of the maize production. The simulated distribution of the impact of the losses of production is derived assigning more weight to those households that have higher percentage of predicted losses. The idea is to test the hypothesis of whether poorer households are those that would be more likely experience losses due to the draught.

Figures 4A to 4E show the estimated impact of different shocks on household per capita expenditure. Two graphs are presented for each shock. The one on the left shows the shift in the distribution of consumption due to the shock; the graph on the right illustrates the "net" impact of the shock on the distribution. The vertical lines correspond to the extreme and regular poverty lines.

The results are not as clear and strong for households suffering from HIV/AIDS: in rural areas the death of an adult hits only a group of poor people, while in urban areas seems to affect consumption of two groups of households – not poor households and poor ones. Similarly, the impact of having orphans in the household is severe in rural areas but less so in urban areas. In rural areas unemployment causes a clear shift to the left in the distribution of log per capita expenditure leaving most of the families worse off. In urban areas the shift is clear only for poor and rich people. Drought, on the other hand, has a large impact on the distribution of consumption of both for the very poor and non poor households in rural areas.

Figure 4A – Expenditure by Experience of Shock: HIV/AIDS – Death of an Adult

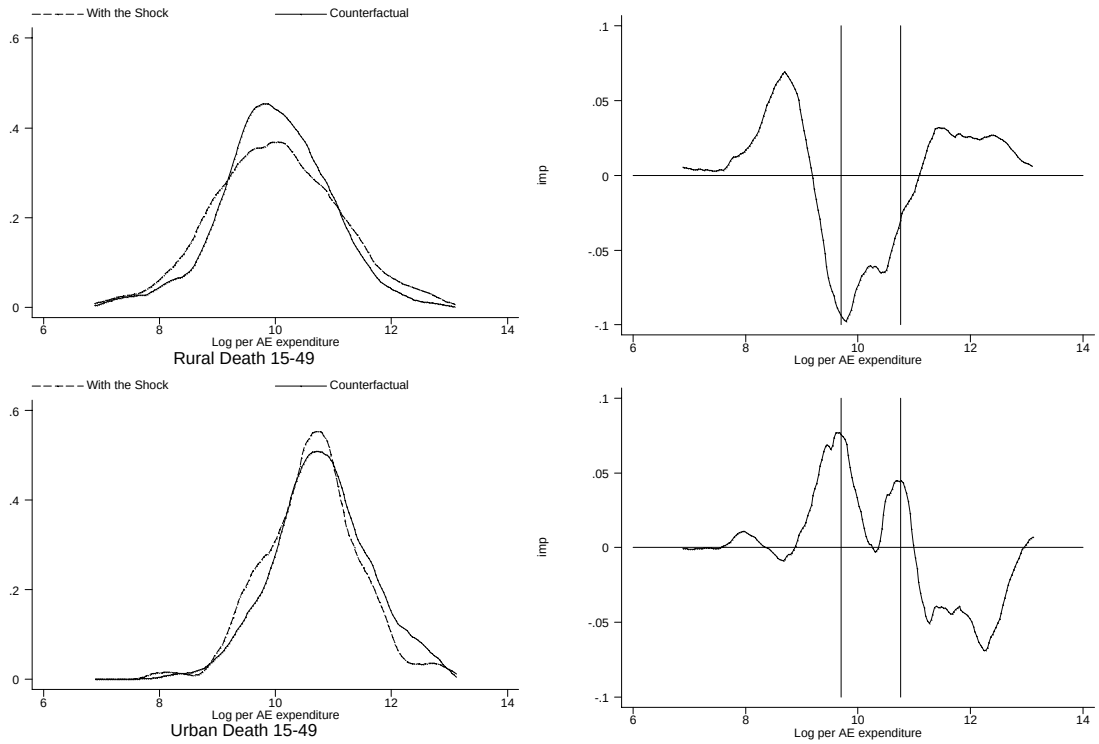


Figure 4B – Expenditure by Experience of Shock: Foster Families

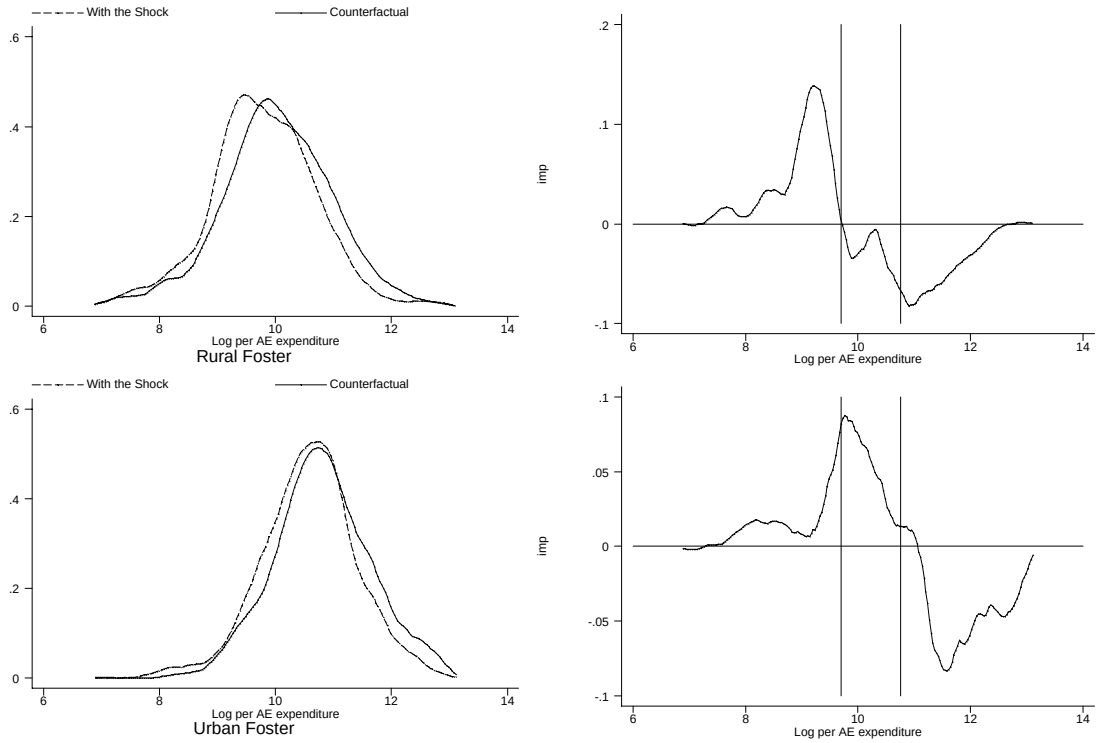


Figure 4C – Expenditure by Experience of Shock: Unemployment

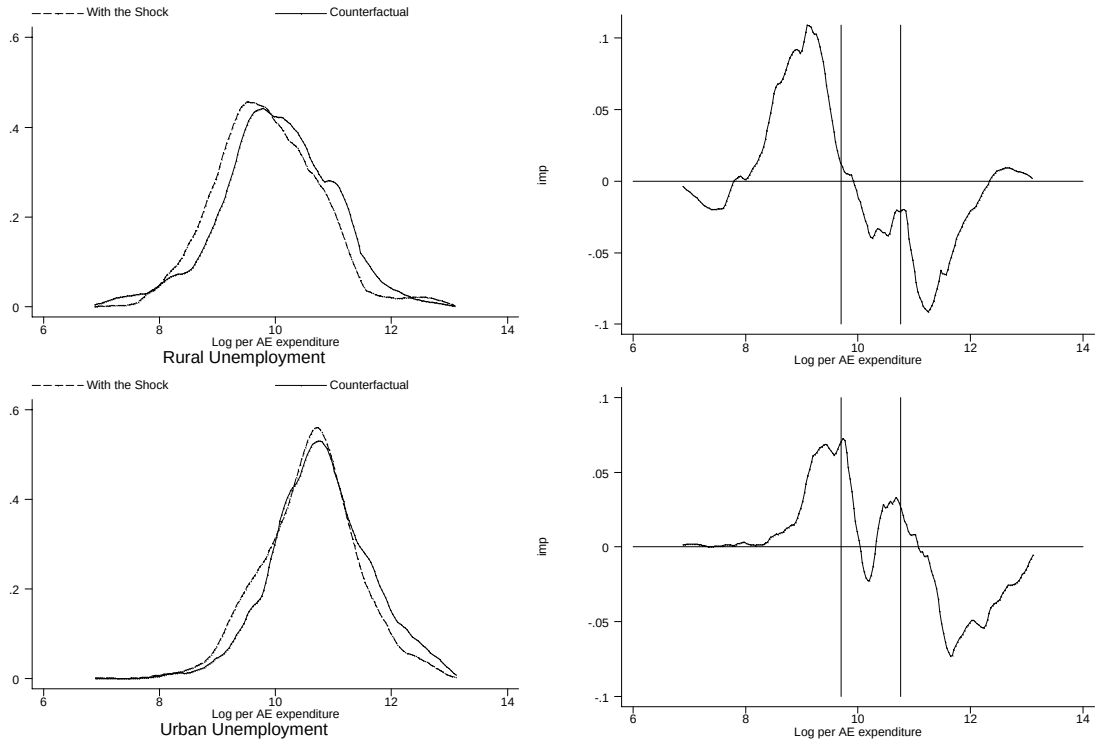


Figure 4D – Expenditure by Experience of Shock: Changed Job and Now Unemployed

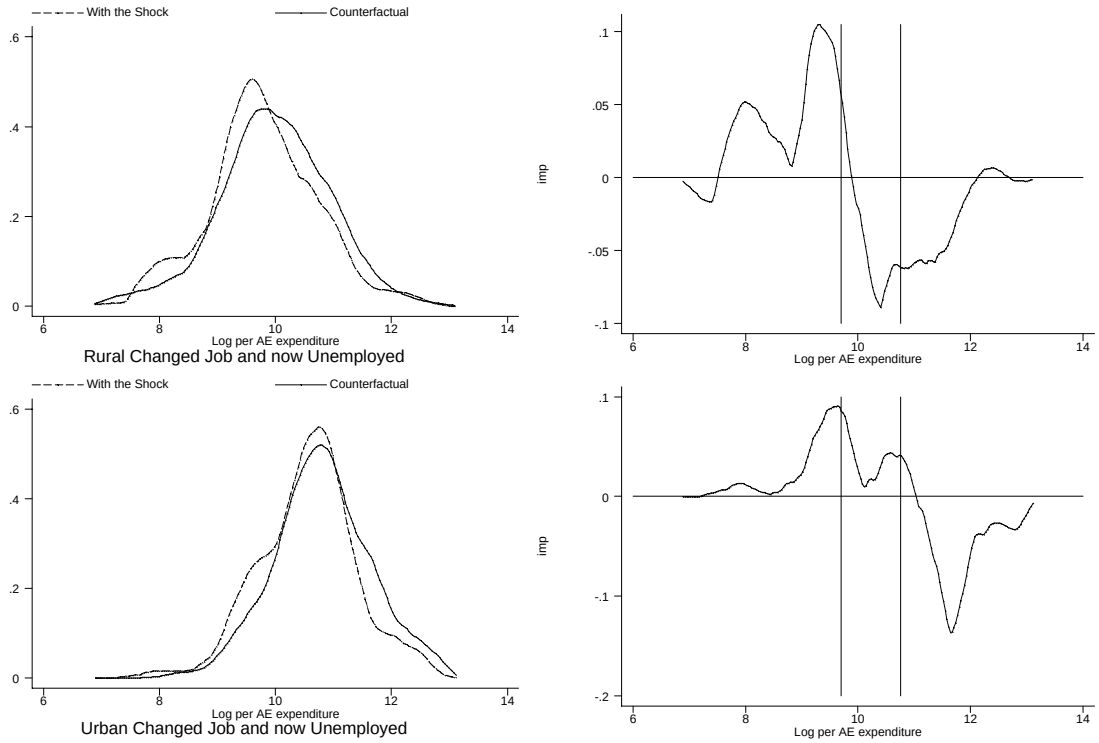
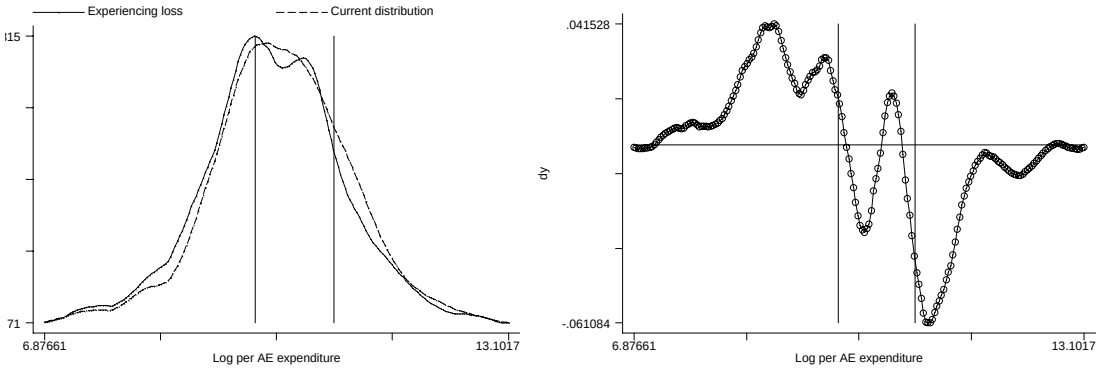


Figure 4E – Expenditure by Experience of Shock: Drought



Source: Author's calculation using CSO 1998 LCMS

Parametric Techniques

Following the work done by Datt and Hoogeven in the Philippines (Datt and Hoogeven, 2003) we used a parametric model to determine the impact of shocks the level of household well-being approximated by household consumption. In practice, we estimate the following regression model:

$$C_i = b_1 X_i + b_2 R_i + b_3 S_i + b_4 W_i$$

where i are the households, C is household consumption; X are household (exogenous) characteristics; R is a set of regional dummies ; S= Shock and W the wealth index[10].

The main concern with the model is whether we are able to establish causality between shocks and outcome or just determine the correlation between them. For example, it is not impossible for HIV/AIDS to be associated with richer households, because of socioeconomic characteristics or because of the increase in the expenditure related to the treatment of the disease or the funeral[11]. For this reason, if the coefficient relative to the death of an adult in the family is positive, it might not mean that HIV/AIDS causes households to be richer but possibly that they had to face higher treatment expenses.

In our estimation procedure we use instrumental variable to get better estimates of the shock variables. The difficulty of finding proper instruments was compounded with the lack of proper data at the household and community level. The solution was to simulate the severity of shocks at local level with cluster level leave-out means as instruments[12]. Table 9 present the result of the estimates of two stage least square (2SLS) models where we consider the shock variables all together, instrumented with the leave-out cluster means.

The results show that the death of an adult has a significant positive relationship with the per capita consumption of rural households despite the fact that we instrumented the variable and therefore potentially control for inverse causality. One possible explanation of the positive effect of HIV/AIDS on consumption would be the positive effect for the household of having lost a consumer and of the reduction of possibly significant medical expenses. As expected, unemployment has a significant negative effect on consumption of rural and poor households, both in urban and rural areas (Table 9). The addition of the indicator of drought in addition to HIV/AIDS and unemployment in the model for rural households does not change the results, while drought does not seem to have a significant impact.

[10] We also tried to estimate the impact of shock variables interacted with wealth and regional dummies but those were not significant.

[11] Medical expenditures for the previous last 12 months are included in the consumption variable. Funeral expenditures are not explicitly recorded in the expenditure module.

[12] These are cluster level means of the variables that have been calculated excluding the individual household.

Table 9 – Effect of Shocks on Per Capita Expenditure – Rural & Urban Area (2SLS)

	All Rural	All Urban	Rural Poor	Urban Poor	All Rural	Rural Poor
At least one died at age 15-49	1.86427	2.59042	0.99186	-1.33827	1.87574	0.99131
	(3.00)***	(1.30)	(1.88)*	(-0.84)	(3.02)***	(1.88)*
At least one unemployed	-0.35577	0.0704	-0.32374	-0.27962	-0.35069	-0.32410
	(1.86)*	(-0.54)	(2.07)**	(2.45)**	(1.83)*	(2.07)**
Loss of maize production					-0.1176	0.0053
Greater than 10% income					(-1.27)	(-0.07)
Observations	8179	6995	6338	3413	8179	6338
R-squared	0.05		0.05		0.05	0.05

Notes: Absolute value of z statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%
Other variables included in the model but not shown are: household composition variables, characteristics of household head (gender, age, widow, separated), number of male and female with different education level by age groups, household wealth and livestock (livestock index), dummy for majority of income coming from agriculture, total area under crop (measured in hac), cluster average land and average income and agricultural income (non self means), number of individual employed in specific professions, distance to main public services (food market, post office, primary school, secondary school, health clinic or hospital, police station, hammer mill, input market, bus, taxi or boat, bank), price variation (both deviation from the province average in 1998 and monthly spread), province dummies.
Instruments include: non self cluster mean of unemployment, HIV/AIDS and drought shocks.
Source: Author's calculation using CSO 1998 LCMS

4. VULNERABILITY TO SHOCKS AND CHRONIC POVERTY

4.1 VULNERABILITY, CHRONIC POVERTY AND HUMAN CAPITAL OUTCOMES

In this section we look at the correlation between the probability of suffering from a shock, extreme poverty and households levels of human capital outcomes[13]. The analysis of the correlation between level of human capital outcomes, poverty and the occurrence of shocks is interesting for several reasons. For policy formulations it is useful to decompose the pool of households vulnerable to shocks in two groups – those who are vulnerable and have low levels of human capital outcomes, and those who are vulnerable but have a high level of human capital outcomes. Ultimately, we are interested in identifying those households that are, at the same time, very poor, have low levels of human capital outcomes and have a higher probability of suffering from the adverse impact of shocks. This is because households that have a low level of human capital outcome are less likely to recover from a shock once they are hit by it and have fewer opportunities of improving their well being in the future. In particular, we are interested in finding out the level of poverty and human capital for those households that suffered from a shock.

The first thing we need to do then is to identify households with low level of human capital. We calculated an index of human capital for each household using factor analysis. According to our definition, households have a higher level of human capital if they do not have any of the following characteristics: have a malnourished child, children who dropped out of school or who never went to

[13] Recall that human capital outcomes are determined by the households past level of well-being and have an impact also on the level of future well-being.

school and don't have any child or elderly person working. The higher the value of the index, the lower the level of human capital outcomes in the family. The distribution of the resulting human capital index across households in Zambia shows that 42 percent of the households have a positive index, which means that have a low level of human capital outcomes.

Using the definition above we found that not all households that are affected by shocks are poor and have low level of human capital outcomes. Among the households that experienced at least one adult death, 42 percent are poor and that 49 percent have low level of human capital, and that 22 percent of them are poor and have low level of human capital, which means that do not have the resources to respond to the occurrence of the shocks and are less likely to improve their level of well being in the near future. Similarly, among those households that have at least one unemployed, 38 percent have low human capital, 41 percent are poor and 18 percent are poor and have low human capital. Finally, 55 percent of the households that suffered from the consequences of a drought have low human capital, 39 percent are poor and 21 percent are poor and have low human capital.

Since not all poor people lack human capital or are affected by the shocks, we believe that it would be useful to identify among poor households those that lack human capital on one side and those that have been affected by a shock on the other side. In practice, we define *chronically poor* those households that have a low human capital index and that are likely to be poor[14]. Similarly, we define households *vulnerable* to shocks if they are likely to suffer from shocks and if they are likely to be poor[15]. Note that while so far we have used variables that are based on actual outcomes, here we are concentrating our attention on expected outcomes, because we are more concerned with a longer and more stable measures of risk and well-being that the actual current outcomes. The outcomes used here include the probability of households of being poor or of suffering from a shock, which have been estimated using the predicted values of the determinants models used in the paper.

Following the definitions outlined above we identify households that are vulnerable to shocks and are chronically poor in Tables 10a, 10b, and 10c. We find that 37 percent of households are chronically poor, with a higher concentration in rural than in urban area (46 vs 20 percent). In the case of vulnerability to shocks, 22 percent of the households are vulnerable to shocks overall, while only 14 percent of them are vulnerable in the urban areas versus 22 percent in the rural areas. The table also shows that about 10 percent (12 percent in rural and 6 percent in urban areas) of the chronically poor households are also at risk of suffering from one of the major shocks identifies in this report.

In sum, households are mostly at risk when they are both vulnerable to shocks and are chronically poor, that is when they are not only likely to be hit by a shock but also lack the level of human capital needed to recover from the shock and to improve their future level of well being. This means that long term investments in social and human capital are crucial to reduce the high level of chronic poverty. At the same time, reduction of vulnerability to shocks should be achieved with a focus on preventive measure rather than ex post alleviation measures.

[14] Households are deemed to be likely to be poor if the level of predicted per adult equivalent expenditure, using the model reported in Table A1, is below the poverty line.

[15] Note that in this case households are defined to be at risk of suffering from shocks if the predicted probably of suffering from a shock is larger than the mean plus one standard deviation.

Table 10A – Chronic and Vulnerable Households – All

	Non Vulnerable	Vulnerable
	81.1	18.9
Non Chronically Poor 63.6	Non Vulnerable And Non Chronically Poor 54.6	Vulnerable And Non Chronically Poor 9.0
Chronically Poor 36.4	Non Vulnerable And Chronically Poor 26.5	Vulnerable And Chronically Poor 9.9

Table 10B – Chronic and Vulnerable Households – Rural

	Non Vulnerable	Vulnerable
	78.3	21.7
Non Chronically Poor 54.2	Non Vulnerable And Non Chronically Poor 44.5	Vulnerable And Non Chronically Poor 9.7
Chronically Poor 45.8	Non Vulnerable And Chronically Poor 33.8	Vulnerable And Chronically Poor 12.0

Table 10C – chronic and vulnerable Households – Urban

	Non Vulnerable	Vulnerable
	86.1	13.9
Non Chronically Poor 80.1	Non Vulnerable And Non Chronically Poor 72.5	Vulnerable And Non Chronically Poor 7.7
Chronically Poor 19.9	Non Vulnerable And Chronically Poor 13.6	Vulnerable And Chronically Poor 6.2

5. COPING MECHANISMS

Chronically poor households and those vulnerable to shocks have to rely on coping mechanism and social programs to smooth their consumption to survive. It is therefore crucial to find out what are the coping mechanisms employed by those households, whether they have access to social program interventions and what other strategies they use to counterbalance the impact of shocks. This information is useful because it can be used to identify potential component of social assistance and services that can be targeted them.

The data set available contains some information (albeit not very detailed) on private transfers, grants and coping mechanisms. Overall 16 percent of households receive remittances, non poor households are more likely to receive remittances and on average receive higher levels of transfers (Table 11). The regional disaggregation of the data shows that the largest percentage of households receiving remittances is in the North Western region (27 percent), and that poor and extremely poor households tend to receive, on average, a higher proportion of remittances than non poor households, especially if living in the Copperbelt, Luapula and Lusaka regions (see Table A3). Grants tend to be

negligible and poor households tend to benefit from them only in North-Western and Southern regions. Pensions tend to benefit non poor and urban households (Table A4).

Table 11 – Percentage of Households Receiving Remittances and Average Value of Transfers

	Percent of households	Average transfer
	%	KW
RURAL		
Non Poor	20.87	9,460
Poor	16.47	4,032
Bottom 30%	13.27	3,157
Total	16.24	4,879
URBAN		
Non Poor	16.10	14,192
Poor	15.04	6,327
Bottom 30%	18.69	4,924
Total	15.92	10,329
ALL		
Non Poor	18.10	12,208
Poor	15.97	4,827
Bottom 30%	13.92	3,368
TOTAL	16.12	6,854

Note: The calculation of the average value of transfers includes all households (i.e. households with zeros transfers are included)
Source: CSO 1998 LCMS

Among the other economic strategies, reported in Table 12, that help households to protect their own income and reduce the impact of shocks, the most common are related to changes in consumption. These include: reducing or substituting number of meals and reducing other household items. A significant proportion of households also rely on the help of friends. The least common strategies were begging from the street or relying on charity from NGOs. Some strategies, like pulling children out of school, are undesirable for their negative long term impact on the household's well being and vulnerability. Extremely poor households in urban areas more often adopt those strategies.

The coping strategies reported above are consistent with those mentioned in a recent report in response to the shock of HIV/AIDS and the drought. The study shows that these households with a chronically ill person are more likely to remove children from school.

This strategy allows the household to liberate some labor and to reduce expenses (on education) but at the same time diminishes the stock of human capital and possibly removes children from some school-related assistance program (i.e. school feeding schemes). Other coping mechanisms adopted by these households are the sale of livestock and poultry and the reduction of the number of *nshima* (corn meal) meals (Zambia VAC, 2003). Households frequently hit by droughts in the southern part of the country, instead, are more likely to diversify their production and start vegetable production and livestock trading. In the areas bordering Tanzania, especially in the northern regions, households benefit also from cross border trade (VAC report, 2003).

Table 12 - Coping Mechanism by Area – (Percentage of households)

	RURAL				URBAN				ALL			
	Non Poor	**Poor**	**Bot 30%**	**Total**	**Non Poor**	**Poor**	**Bot 30%**	**Total**	**Non Poor**	**Poor**	**Bot 30%**	**Total**
Piecework on farms	27.5	33.6	43.3	35.6	4.1	10.6	25.4	8.5	11.5	22.6	39.9	22.2
Other piecework	29.1	35.2	42.5	36.3	14.5	23.5	39.9	20.2	19.1	29.6	42.0	28.4
Food for work	16.5	18.5	22.2	19.3	2.7	6.3	15.5	5.2	7.0	12.6	20.9	12.4
Relief food	9.7	9.3	9.5	9.5	2.0	2.4	3.2	2.2	4.4	6.0	8.3	5.9
Wild food only	20.2	23.0	30.0	24.8	2.8	6.2	14.5	5.1	8.3	14.9	27.0	15.1
Substituting ordinary meals	43.6	52.7	61.0	53.5	33.3	49.5	64.7	42.2	36.5	51.2	61.7	47.9
Reducing number of meals	55.5	65.6	70.9	65.1	50.0	68.2	73.8	59.1	51.8	66.8	71.5	62.1
Reducing other hh items	53.0	62.0	64.7	60.8	53.5	68.7	69.9	60.8	53.4	65.2	65.7	60.8
Informal borrowing	26.0	23.2	20.4	22.9	33.7	42.9	33.2	37.3	31.3	32.7	22.9	30.0
Formal borrowing	4.8	3.0	2.2	3.1	12.9	8.6	4.5	10.5	10.3	5.7	2.6	6.8
Church Charity	4.8	4.4	3.5	4.1	5.3	5.8	8.6	5.8	5.1	5.1	4.4	5.0
NGO Charity	2.4	2.1	2.2	2.2	1.0	1.5	2.7	1.3	1.4	1.8	2.3	1.8
Pulling children out of school	5.3	7.0	10.3	7.8	3.9	11.5	22.1	8.4	4.4	9.2	12.6	8.1
Sale of assets	18.3	16.7	13.6	16.0	10.6	13.1	15.8	12.0	13.0	15.0	14.0	14.0
Petty vending	16.0	16.4	13.0	15.1	15.8	25.9	27.9	20.7	15.8	21.0	15.8	17.9
Asking from friends	58.8	59.1	55.1	57.6	53.5	63.2	70.1	58.7	55.2	61.1	58.0	58.2
Begging from the streets	1.0	0.6	0.8	0.8	0.7	1.1	1.8	1.0	0.8	0.8	1.0	0.9
Other	1.7	1.1	1.3	1.3	1.2	0.8	0.9	1.0	1.4	0.9	1.2	1.2

Source: CSO 1998 LCMS

5.1 RELATIONSHIP BETWEEN SHOCK, VULNERABILITY AND CHRONIC POVERTY

The analysis of the relationship between unemployment, HIV/AIDS and drought shocks and the adoption of different coping mechanisms can show whether poor households are able to absorb the impact of the shocks by making use of coping mechanisms. Tables 13A-C present some descriptive statistics of the difference between the adoption of the two main coping mechanisms (participation in food for work and transfers, including remittances) by households affected by the different shocks controlling for their poverty level.

In the case of HIV/AIDS the amount of transfers received decreases significantly only for non-poor rural households whilst increases for extremely poor households in urban areas. It also appears that extremely poor rural households that experienced a death tend also to have a lower food for work participation rate. In case of unemployment, we found that households that have at least one person unemployed tend to receive larger amounts of remittances. This result would reflect the tendency that relatives of households would be more likely to provide transfers in case of unemployment and therefore that informal transfers are effective coping mechanisms for them. Extremely poor households in rural areas have also higher rates of participation in food for work. Households more likely hit by the negative impact of the drought on the other hand, are those that on average receive smaller amounts of transfers and have lower rates of participation in food for work activities. These results are not surprising, given the fact that those households have not suffered any shock yet.

Table 13A – Main Coping Mechanisms Used by Households Affected by HIV/AIDS or Unemployment Shocks - Rural Area

		Poverty Categories			
		Non Poor	Poor	Bot 30%	Total
HIV/AIDS Shock					
	Food for work (%)	18.7	18.9	22.2	20.1
No deaths	Transfers (Kw mo)	17,215	6,905	4,872	8,335
	Food for work (%)	17.4	20.1	18.9	19.0
At least one death 15-49 (last 12m)	Transfers (Kw mo)	7,535	11,600	6,120	8,514
Unemployment Shock					
	Food for work (%)	18.7	18.9	21.7	19.9
No Unemployed	Transfers (Kw mo)	16,041	7,021	4,581	8,076
	Food for work (%)	17.1	20.8	27.1	23.1
At least one unemployed (last 12m)	Transfers (Kw mo)	29,580	10,362	10,797	13,565
	Food for work (%)	18.6	19.0	22.0	20.0
Total	Transfers (Kw mo)	16,531	7,175	4,956	8,346

Table 13B - Main Coping Mechanisms Used by Households Affected by HIV/AIDS or Unemployment Shocks – Urban Area

		Poverty Categories			
		Non Poor	Poor	Bot 30%	Total
HIV/AIDS Shock					
	Food for work (%)	1.7	4.6	10.5	3.6
No deaths	Transfers (Kw mo)	29,911	15,874	8,426	22,618
	Food for work (%)	1.5	7.7	9.6	5.2
At least one death 15-49 (last 12m)	Transfers (Kw mo)	44,497	16,523	14,974	28,618
Unemployment Shock					
	Food for work (%)	1.6	4.4	11.3	3.4
No Unemployed	Transfers (Kw mo)	28,401	15,839	7,692	22,080
	Food for work (%)	1.9	6.2	8.6	4.7
At least one unemployed (last 12m)	Transfers (Kw mo)	41,418	16,168	11,715	26,343
	Food for work (%)	1.7	4.8	10.4	3.7
Total	Transfers (Kw mo)	30,634	15,915	9,032	22,970

Table 13C - Main Coping Mechanisms Used by Households that are more likely to be affected by Drought (PLI>10%) in absence of the drought – Rural Area

		Poverty Categories			
		Non Poor	Poor	Bot 30%	Total
	Food for work (%)	22.8	24.0	28.1	25.0
No Drought	Transfers (Kw mo)	17,877	8,159	7,060	10,164
	Food for work (%)	18.9	20.9	25.1	22.8
Drought (PLI>10%)	Transfers (Kw mo)	8,051	4,119	2,302	3,638
	Food for work (%)	22.4	23.5	27.4	24.6
Total	Transfers (Kw mo)	16,995	7,477	5,822	8,967

Notes: Remittances are the largest component of all transfers reported here.
The value of transfers include zeros values
Source: CSO 1998 LCMS

Finally, we used a modification of the model used above to assess the impact of shocks and coping mechanisms on household consumption. First, we consider the impact of the adoption of at least one coping mechanism among the different ones available[16] (model 0 and model 1). Secondly, we evaluate the effect of coping controlling for the occurrence of the three different shocks (model 2). The third model we disaggregate the effect of coping mechanisms by the type of shock that hit the household (model 3). With the exception of model 0, the estimates have been obtained using two

[16] Possible coping mechanisms considered here include: transfers received, percentage of non-wage income, participation in food for work programs, piecework on farms, other piecework, eating wild food only, substituting ordinary meals, reducing the number of meals, reducing the number of assets, borrowing informally, selling assets, petty vending, asking help from friends.

stage least squares estimators in order to control for the endogeneity of the shocks and of the adoption of coping mechanisms.[17]

The results are summarized in Table 14. In model 0 (not instrumented) and model 1 the adoption of at least one coping mechanism is negatively correlated with consumption, showing how poor households are more likely to make use of coping mechanisms. In model 2 and model 3 the effect of coping controlling for the event of any of the shocks (unemployment, HIV/AIDS and drought) is still negative and significant and becomes larger. In model 2 unemployment and HIV/AIDS shocks are, holding everything else constant, positively correlated with household consumption. Household consumption increases for richer households after they are hit by HIV/AIDS or unemployment, perhaps because they are able to release some resources (for example these might include savings from not paying anymore for medical expenses of the terminally ill) or they receive extra transfers (as seen in table 13B). Once we control for the adoption of any coping strategy (model 3) the results remain similar and do not change very much.

Table 14 – Modeling the Relationship between Shock, Coping Mechanisms and Poverty

Coping and Shock Variables Included	*Model 0*	*Model 1*	*Model 2*	*Model 3*
Using at least one coping mechanism (Instrumented)		-1.81*** (-10.3)	-2.61*** (-8.9)	-2.93*** (-8.5)
Using at least one coping mechanism (non instrumented)	-0.13*** (-6.49)			
Unemployment shock			0.35** (2.3)	
HIV/AIDS shock			3.03*** (3.8)	
Drought shock			-0.51*** (-4.2)	
Coping if unemployed				0.41** (2.5)
Coping if HIV/AIDS				3.19*** (3.7)
Coping if drought				-0.58*** (-4.2)

Notes: Absolute value of z statistics in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%
Other variables included in the model but not shown are: household composition variables, characteristics of household head (gender, age, widow, separated), number of male and female with different education level by age groups, household wealth and livestock (livestock index), dummy for majority of income coming from agriculture, total area under crop (measured in hac), cluster average land and average income and agricultural income (non self means), number of individual employed in specific professions, distance to main public services (food market, post office, primary school, secondary school, health clinic or hospital, police station, hammer mill, input market, bus, taxi or boat, bank), price variation (both deviation from the province average in 1998 and monthly spread), province dummies.
Instruments include: household self perceptions of poverty, non self cluster mean of unemployment, HIV/AIDS and drought shocks.
Source: Author's calculation using CSO 1998 LCMS

[17] The instruments used are the non-self cluster mean of occurrence of the shocks and the variable of self assessment of poverty. This variable could be a good instrument because people that think they are poor are more likely to resort to the use of coping mechanisms. On the other hand it is most likely highly correlated with per capita expenditure level.

6. CONCLUSIONS

Zambia is a country characterized by a high incidence of poverty and exposure to several types of shocks like HIV/AIDS, macroeconomic instability and periodic droughts. In this paper we have analyzed separately the incidence and impact of those shocks on the poverty level of the households an assessed if they have access to any effective mitigating or coping mechanism to face those shocks.

The analysis of the impact of the HIV/AIDS epidemic has been carried out using the data on the occurrence of the death of an adult in the previous 12 months and the existence of foster children (17 percent of children under 15 years of age do not have at least one living parent). The non parametric analysis shows that among the households that are more likely to experience a death in the family in rural areas only those, which are very poor households have lower consumption level, while for the non poor households there is an increase in consumption (possible due to the use of child and elderly labor), which may result in a lower level of investment in human capital. These results are consistent with a positive correlation of the occurrence of a death in the family with the level of income (consumption) in the parametric model correlation in rural areas and not significant in urban. Private transfers do not seem to be effective in helping households to cope with the death of a household member and household participation in food for work programs decreases for very poor households after the death of a households member. Given the fact that the magnitude of the problem might have increased substantially since 1998 and might become even larger in the future[18], this is a problem that needs to be addressed effectively and urgently.

The deterioration of the economic climate caused, among other factors, by lower copper prices, has resulted in a high level of unemployment, concentrated in urban areas (21 percent overall and 33 percent for the very poor) especially among those with lower level of assets. The negative impact of the increase in unemployment is illustrated by a lower level of consumption between very poor and rich households that are more likely to have at least one of their household members unemployed compared to those that do not report any unemployed household members. These results are confirmed by a negative and significant coefficient for poor in urban areas in the parametric model. Coping mechanisms in the form of private transfers are higher for very poor households with unemployed person in urban areas and food for work is used more often in rural areas. This means that while general economic growth and policies to increase employment are essential, at the same time there also need to develop specific programs for those that lack the necessary skills to attract investments.

Several droughts hit Zambia in the 90s and most recently in 2002. They caused widespread losses of production of maize, which is the main staple food (maize provides more than 70 percent of average caloric consumption), death of cattle and food shortage that resulted in higher consumer prices. The recent experience has shown that losses of production are concentrated in a few communities in Southern, Central and Western provinces, even though production is much higher in the Eastern region. The estimates of our predictions show that 17 percent of the poorest households in rural areas would experience significant losses in maize production (and 8 percent of all the households). The models also show that poor households in the rural areas would be more likely to suffer production losses and have lower consumption levels. This is the result of the fact that poor

[18] Subbarao (2001) estimates that there will be more than 1.7 million orphans in Afica by 2010.

households that are more likely to experience income losses derive on average more than 70 percent of their income from agriculture. Because the loss of income that it is associated with the occurrence of the drought appears to be localized, this suggests the need to target effectively alleviation programs. At the same time the need for sound food policy that reduces the large variation in prices across space and time and to promote effective diversification of production and livelihood systems remains strong.

The analysis in the paper also showed that the correlation between the occurrence of these shocks is low. This means that the same households do not face all these problems together. At the same time it is important to find out if the households that suffer from shocks are poor and/or have low human capital. For this purpose we define "vulnerable households", those that are likely to be poor and exposed to shocks, and "chronically poor households, those that are likely to be poor and have low levels of human capital outcomes. Poor households are less likely to recover from the shocks presented above and those that are chronically poor are going to be less likely to improve their economic status unless they do not make the necessary investment in their level of human capital. We found that about 20 percent of the households turn out to be vulnerable whilst almost 36 percent are chronically poor. 10 percent are at the same time both vulnerable and chronically poor and therefore at most at risk

In conclusions, in Zambia there are households that are vulnerable to shocks and have low level of human and physical capital, and do not have adequate means of responding to natural or economic shocks. Therefore there is a need to develop appropriate poverty alleviation programs in combination with policies to improve economic growth and ex-ante drought mitigation programs. In particular it would be important to put more emphasis on a) long term strategies to provide poor and vulnerable households with effective means to maintain and increase their investment in human capital and to protect them from the adverse impact of current and future shocks; b) programs that can address the growing problem of orphans; and c) more effective targeting interventions of the emergency programs necessary to alleviate the impact of weather related shocks like the drought.

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Appendix Tables

Table A 1 – Poverty rates and percentage of population, poor below the poverty line and in the bottom 30 percentile of the distribution by province and location in 1998

	Poverty rates (Population)			Percent of population			Percent of non Poor			Percent of poor			Percent of bott 30%		
	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban	Total	Rural	Urban	Total
CENTRAL	83.71	63.25	76.76	6.6	3.4	10.0	4.0	4.6	8.6	5.8	3.8	9.7	10.1	1.7	11.7
N. people	671,019	345,288	1,016,307												
COPPERBELT	82.92	59.75	64.99	4.0	13.9	17.9	2.6	20.6	23.2	4.0	14.9	18.9	5.4	6.3	11.7
N. people	412,580	1,413,046	1,825,626												
EASTERN	81.68	66.07	80.25	11.5	1.2	12.7	7.8	1.5	9.3	11.3	1.4	12.8	15.3	0.5	15.8
N. people	1177898	118,911	1296809												
LUAPULA	85.1	54.82	80.88	5.9	1.0	6.8	3.2	1.6	4.8	6.0	1.0	6.9	8.2	0.3	8.5
N. people	601,146	97,269.10	698,415												
LUSAKA	77.03	46.88	51.95	2.5	12.5	15.0	2.1	24.5	26.6	2.2	11.6	13.8	3.3	3.0	6.3
N. people	256,907	1,271,394	1,528,301												
NORTHERN	83.58	67.95	81.12	10.1	1.9	12.0	6.2	2.2	8.4	10.6	2.3	12.8	13.2	1.1	14.3
N. people	1,034,534	192,706	1,227,240												
N-WESTERN	78.75	56.57	75.77	4.6	0.7	5.4	3.6	1.2	4.8	5.0	0.7	5.7	5.0	0.3	5.3
N. people	472,851	73,469.50	546,320												
SOUTHERN	81	52.69	75.78	10.3	2.3	12.6	7.2	4.1	11.3	10.4	2.3	12.7	13.0	0.8	13.8
N. people	1050747	237,499	1288246												
WESTERN	91.2	71.82	89.15	6.6	0.8	7.3	2.1	0.8	2.9	5.7	1.0	6.7	11.8	0.5	12.3
N. people	669,667	79,276.40	748,944												
Total	83.09	56.03	72.91	62.2	37.5	100.0	38.9	61.1	100.0	61.0	39.0	100.0	85.3	14.5	100.0
N. people	6,347,348	3,828,859	10,200,000												

Source: CSO 1998 LCMS household survey

Table A2 – Determinants of Per Capita Expenditure Models

Instrumental variables (2SLS) regression – Shocks instrumented with non self cluster means

Source	SS	df	MS		
Model	2553.0028	64	39.8906687	Number of obs	15173
Residual	12014.9056	15108	.795267777	F(64, 15108)	117.84
Total	14567.9084	15172	.960183784	Prob > F	0.0000
				R-squared	0.1752
				Adj R-squared	0.1718
				Root MSE	.89178

lpae	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
hh_unemp	-.0021546	.1023334	-0.02	0.983	-.2027405	.1984312
hh_d1549	2.026826	.543489	3.73	0.000	.9615219	3.09213
femhead	-.0154646	.0359491	-0.43	0.667	-.0859292	.055
agehead	-.0081489	.0009618	-8.47	0.000	-.0100342	-.0062637
widfhead	-.3441463	.0688768	-5.00	0.000	-.4791533	-.2091394
sepfhead	-.1799697	.043459	-4.14	0.000	-.2651545	-.0947848
m0_4	-.0235726	.0124512	-1.89	0.058	-.0479786	.0008333
m5_14	-.1038602	.0558868	-1.86	0.063	-.213405	.0056846
m15_19	-.1373695	.0569984	-2.41	0.016	-.2490932	-.0256458
m20_34	-.1229293	.0575845	-2.13	0.033	-.2358019	-.0100567
m35_49	-.1429707	.0599724	-2.38	0.017	-.2605238	-.0254176
m50_64	-.1584714	.0650008	-2.44	0.015	-.2858808	-.0310619
m65_	-.1053023	.068285	-1.54	0.123	-.2391492	.0285446
f0_4	-.0659215	.0118652	-5.56	0.000	-.0891786	-.0426643
f5_14	-.0016947	.0454964	-0.04	0.970	-.0908732	.0874839
f15_19	-.0492888	.0469064	-1.05	0.293	-.141231	.0426534
f20_34	-.0066004	.0476691	-0.14	0.890	-.1000377	.0868369
f35_49	.0309728	.0503249	0.62	0.538	-.06767	.1296156
f50_64	-.0244097	.0521482	-0.47	0.640	-.1266266	.0778072
f65_	.1032403	.0533609	1.93	0.053	-.0013536	.2078342
fedu0	-.1745706	.0463607	-3.77	0.000	-.2654431	-.0836981
fedu1	-.0964112	.045792	-2.11	0.035	-.1861691	-.0066533
fedu2	-.0458548	.047752	-0.96	0.337	-.1394545	.0477449
fedu3	-.050072	.0472824	-1.06	0.290	-.1427512	.0426073
medu0	-.0631938	.0564082	-1.12	0.263	-.1737607	.047373
medu1	-.0089218	.0556793	-0.16	0.873	-.11806	.1002163
medu2	.0155173	.0569192	0.27	0.785	-.0960511	.1270857
medu3	.0665288	.0565935	1.18	0.240	-.0444013	.177459
fasset	.2766892	.0124528	22.22	0.000	.2522803	.3010981
hh_agin	-.1262805	.0204817	-6.17	0.000	-.1664272	-.0861339
wmanag	.107828	.0576215	1.87	0.061	-.005117	.2207731
wprof	.2346922	.0302264	7.76	0.000	.1754449	.2939396
wtech	.1736137	.0368667	4.71	0.000	.1013506	.2458768
wclerk	.1425414	.0386936	3.68	0.000	.0666973	.2183854
wsale	.1212707	.0207943	5.83	0.000	.0805114	.16203
wagric	.0350745	.0131637	2.66	0.008	.009272	.060877
wtrade	.1061509	.0280355	3.79	0.000	.051198	.1611039
wmech	.1291586	.0341062	3.79	0.000	.0623064	.1960109
wbasic	.0808041	.0228122	3.54	0.000	.0360895	.1255187
warmy	.0752698	.0606144	1.24	0.214	-.0435418	.1940814
land	.0430483	.0040884	10.53	0.000	.0350346	.051062
flives	.0878497	.0180017	4.88	0.000	.0525641	.1231353
cland	-.0462586	.010078	-4.59	0.000	-.0660128	-.0265045
lcinc	.2465593	.0124917	19.74	0.000	.2220741	.2710445
lcaginc	.0211647	.0068512	3.09	0.002	.0077354	.0345939
distfoma	.000122	.0006703	0.18	0.856	-.001192	.001436
distpost	-.0004398	.00057	-0.77	0.440	-.001557	.0006774

```
    distpscl |   .0021694   .0015653     1.39   0.166    -.0008988    .0052376
    distsscl |  -.0005194   .0004564    -1.14   0.255     -.001414    .0003751
    disthosp |   .0003489   .0009535     0.37   0.714    -.0015201     .002218
    distpolt |   .0016642   .0005826     2.86   0.004     .0005223    .0028062
    distmill |  -.0029458   .0009517    -3.10   0.002    -.0048113   -.0010803
    distiput |   .0014856   .0004253     3.49   0.000     .0006519    .0023192
    distrans |   .0002085   .0007843     0.27   0.790    -.0013287    .0017458
    distbank |  -.0002362   .0003553    -0.66   0.506    -.0009326    .0004603
      pd1998 |    -.00017   .0000814    -2.09   0.037    -.0003294   -.0000105
         PR2 |   .1193367   .0281232     4.24   0.000     .0642118    .1744615
         PR3 |    .201805    .031501     6.41   0.000     .1400591    .2635508
         PR4 |   .2132476   .0349918     6.09   0.000     .1446595    .2818357
         PR5 |   .2104364   .0323184     6.51   0.000     .1470885    .2737843
         PR6 |    .225587   .0400526     5.63   0.000     .1470791     .304095
         PR7 |   .3132375   .0354721     8.83   0.000     .2437078    .3827672
         PR8 |   .0456195   .0367228     1.24   0.214    -.0263615    .1176006
      rururb |   .1691091   .0260829     6.48   0.000     .1179835    .2202347
       _cons |   7.518406   .1436534    52.34   0.000     7.236828    7.799984
------------------------------------------------------------------------------
Instrumented:  hh_unemp hh_d1549
Instruments:   femhead agehead widfhead sepfhead m0_4 m5_14 m15_19 m20_34
               m35_49 m50_64 m65_ f0_4 f5_14 f15_19 f20_34 f35_49 f50_64 f65_
               fedu0 fedu1 fedu2 fedu3 medu0 medu1 medu2 medu3 fasset hh_agin
               wmanag wprof wtech wclerk wsale wagric wtrade wmech wbasic warmy
               land flives cland lcinc lcaginc distfoma distpost distpscl
               distsscl disthosp distpolt distmill distiput distrans distbank
               pd1998 ps1998 PR2 PR3 PR4 PR5 PR6 PR7 PR8 PR9 rururb Cunem
               Cd1549
------------------------------------------------------------------------------
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Table A3 – Percentages of Households Receiving Remittances and Average Level of Transfers by Province

	Rural/Urban and Poverty Categories											
	Rural				Urban				Total			
Province	Non Poor	Poor	Bot 30%	Total	Non Poor	Poor	Bot 30%	Total	Non Poor	Poor	Bot 30%	Total
CENTRAL	2.90	4.99	5.26	4.70	13.48	7.87	10.90	10.86	8.97	6.05	6.10	6.91
	4920	1085	775	1694	16704	3299	1401	9262	11679	1903	868	4410
COPPERBELT	27.38	26.34	29.91	27.73	13.35	13.72	18.35	14.05	15.35	17.24	24.20	17.59
	11421	7461	6985	8229	13689	6685	5126	9923	13364	6902	6067	9484
EASTERN	28.20	13.40	8.79	15.10	22.63	9.77	8.90	14.83	27.34	13.02	8.80	15.08
	16623	3830	3296	6522	7658	4530	2139	5495	15243	3903	3257	6427
LUAPULA	26.00	19.35	13.94	18.57	10.72	8.88	25.15	11.22	22.07	18.10	14.29	17.69
	6876	2509	2792	3436	9322	3661	12339	7133	7505	2647	3095	3881
LUSAKA	11.80	14.34	6.55	10.94	18.96	20.72	26.51	19.82	18.36	19.58	13.54	18.36
	7894	4122	1539	4334	17032	7108	7087	13340	16267	6577	3482	11854
NORTHERN	20.93	16.83	15.80	17.31	18.99	12.49	21.47	16.33	20.45	16.16	16.16	17.17
	4232	4237	3065	3818	6010	5136	3820	5291	4669	4375	3113	4034
N-WESTERN	32.64	27.71	22.66	27.67	17.18	29.48	25.77	23.00	29.57	27.91	22.84	27.08
	20835	5803	5955	10105	2796	10076	5122	5898	17272	6287	5905	9578
SOUTHERN	13.33	15.18	11.67	13.56	14.07	13.47	21.36	14.42	13.60	14.86	12.24	13.74
	4722	4712	2316	3921	9686	6198	7305	8200	6562	4987	2608	4805
WESTERN	15.64	15.51	13.92	14.75	11.98	12.65	16.28	12.97	15.01	15.17	13.98	14.60
	3703	3443	3464	3491	5733	10179	5364	8042	4051	4254	3516	3881
Total	20.87	16.47	13.27	16.24	16.10	15.04	18.69	15.92	18.10	15.97	13.92	16.12
	9460	4032	3157	4879	14192	6327	4924	10329	12208	4827	3368	6854

Note: The first row shows the percentage of households receiving the transfer, the second reports the average value of the transfer per household (i.e. households with zeros transfers are included)

Table A4 - Percentages of Households Receiving Grants and Average Level of Grants by Province

	Rural/Urban and Poverty Categories											
	Rural				Urban				Total			
Province	Non Poor	Poor	Bot 30%	Total	Non Poor	Poor	Bot 30%	Total	Non Poor	Poor	Bot 30%	Total
CENTRAL	0.08	0.40	0.00	0.17	1.15	1.95	0.00	1.33	0.70	0.97	0.00	0.59
	209	234	0	131	1089	1257	0	1016	714	612	0	449
COPPERBELT	0.66	1.12	0.49	0.81	1.55	1.33	2.02	1.51	1.42	1.27	1.25	1.33
	315	2752	172	1355	330	361	434	354	328	1028	302	614
EASTERN	2.16	0.53	0.63	0.93	3.57	1.24	0.00	2.03	2.37	0.60	0.61	1.03
	310	73	114	141	1824	131	0	795	543	79	110	201
LUAPULA	0.00	0.00	0.00	0.00	0.00	3.67	0.00	1.59	0.00	0.44	0.00	0.19
	0	0	0	0	0	525	0	228	0	63	0	27
LUSAKA	1.40	0.94	0.16	0.80	0.85	0.40	0.66	0.69	0.90	0.50	0.33	0.71
	1917	1081	2	955	3322	366	395	2224	3204	493	139	2014
NORTHERN	0.59	0.08	0.04	0.17	2.53	0.07	0.00	1.02	1.07	0.08	0.04	0.30
	93	321	2	160	175	13	0	75	113	274	2	148
N-WESTERN	1.31	0.53	0.00	0.60	4.57	2.95	4.90	3.99	1.96	0.81	0.29	1.03
	491	102	0	183	1338	145	858	817	658	107	51	262
SOUTHERN	1.48	1.00	3.14	1.83	1.18	0.29	2.55	0.95	1.37	0.87	3.11	1.65
	320	134	1296	564	1287	63	128	740	678	121	1227	600
WESTERN	2.47	3.59	0.99	2.15	2.43	0.55	0.00	1.08	2.46	3.22	0.96	2.06
	385	620	23	293	2261	497	0	992	706	605	22	353
Total	1.22	0.83	0.70	0.87	1.33	1.05	1.27	1.22	1.29	0.91	0.77	1.00
	347	430	194	325	1726	409	280	1088	1148	423	204	602

Note: The first row shows the percentage of households receiving the transfer, the second reports the average value of the transfer per household (i.e. households with zeros transfers are included)

Zambia is a county characterized by a high incidence of poverty and exposure to several types of shocks like HIV/AIDS, macroeconomic instability and periodic droughts. In this paper we conduct an in depth analysis of the incidence and impact of those shocks on poverty. The analysis of the HIV/AIDS epidemic, carried out using the data on the occurrence of the death of an adult in the previous 12 months and the existence of foster children, shows the existence of a general decrease in consumption with the exception of non poor rural families. The deterioration of the economic situation and the related high level of unemployment resulted in a lower level of economic well-being. Finally, the analysis of the impact of the drought shows that while a significant percentage (17 percent) of the poorest households in rural areas would experience significant losses in maize production (covering 8 percent of all the households), they are concentrated in a few communities in Southern, Central and Western provinces. In order to identify those households that might suffer more from the negative impact of the shocks and/or have a low level of human capital we defined "vulnerable households", those that are likely to be poor and exposed to shocks, and "chronically poor households", those that are likely to be poor and have low levels of human capital outcomes. According to this definition, about 20 percent of the households are vulnerable whilst almost 40 percent are chronically poor and 10 percent are at the same time both vulnerable and chronically poor and therefore at most risk. Private coping mechanisms and private transfers are very common, but they do not seem to be effective in helping households to deal with the adverse impact of shocks. On the other hand, household participation in food for work programs increase after the death of a household member. Therefore there is need for long term household human capital investments, programs to alleviate the burden of HIV/AIDS, and targeted programs for the alleviating weather related shocks like the drought.

HUMAN DEVELOPMENT NETWORK

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